

Bull. Natn. Sci. Mus., Tokyo, Ser. A, 15(2), pp. 105–137, June 22, 1989

The Taiwanese Species of the Genus *Epaphiopsis* (Coleoptera, Trechinae)¹⁾

By

Shun-Ichi UÉNO

Department of Zoology, National Science Museum, Tokyo

Abstract The Taiwanese species of the trechine genus *Epaphiopsis* are dealt with. They are classified into ten species of two different lineages. The *multipunctata* group is more archaic and more intensively differentiated than the *formosana* group, and is considered older than the latter, which is at the sibling level of speciation. The former contains five species, named *E. multipunctata*, *E. kasaharai*, *E. elegans*, *E. divarboris* and *E. yushana* spp. nov.; the latter also contains five species, *E. formosana* (JEDLIČKA), *E. apiceplana*, *E. shibatai*, *E. alticola* and *E. hsuehshana* spp. nov. A new endemic subgenus, *Formosiellus*, is erected for receiving these species, all of which are wingless and restricted to the subalpine and/or alpine zones of central mountains on the island.

Taiwan is a continental island lying off the eastern coast of China. It is not large but is surmounted with very high mountains, some of which almost attain to a height of 4,000 m. Many of them are very steep and intricately carved by very deep valleys, but often have less steep cirques near the tops, which dated in the Last Glacial Period of the Pleistocene. Timber limit is rather high and alpine meadows are not widespread, but *Abies* forests with humid mossy floors are commonly found. For these reasons, Taiwan harbours various high altitude inhabitants of cold-temperate origin, though it lies just on the edge of the tropics. Unfortunately, it is not easy to climb up those high mountains, so that investigation of the high altitude fauna has not been satisfactorily made until now. Trechine beetles are exceptional in this respect, but even these cannot be said to have been thoroughly studied.

Four genera of trechine beetles in a strict sense have been known until now from the high mountains of Taiwan. Three of them comprise only one known species respectively, that is, *Trechiana alatus* S. UÉNO (1979, p. 202, figs. 1–4), *Agonotrechus horni* JEDLIČKA (1932, p. 82; UÉNO, 1980, p. 108, figs. 1–3), and *Taiwanotrechus subglobosus* S. UÉNO (1987, p. 338, figs. 1–3). Of these, the second species is most widespread both horizontally and vertically, ranging from about 1,250 m to 2,300 m in altitude and showing altitudinal wing dimorphism. The other two are strictly high altitudinal, and each has been known from only a single high mountain. The fourth

1) This study is supported by the Grant-in-aid No. 01041099 for Field Research of the Monbusho International Scientific Research Program, and in part by the Grant-in-aid No. 63540603 for Scientific Research from the Ministry of Education, Science and Culture, Japan.

genus is *Epaphiopsis*, which is the subject of the present paper.

The genus *Epaphiopsis* is the largest and most widespread of the genera belonging to the *Epaphiopsis* group. It is most abundant in the Japanese Islands, but this is doubtless due to intensive investigations made during the past forty years. Outside Japan, this genus has been recorded from the Soviet Far East and Taiwan, and though not satisfactorily known from Mainland China (DEUVE, 1988, pp. 256–259), extends its range to the southwestern Altai in the northwest (SHILENKOV & SOKOLOV, 1987, pp. 102–103) and to the eastern Himalayas in the southwest (UÉNO & PAWŁOWSKI, 1983). From Taiwan, only one species, *E. formosana* (JEDLIČKA) (1946, p. 2, pl. 2, fig. 12; UÉNO, 1962, p. 43), has previously been reported, but there are at least nine more species that await descriptions. These Taiwanese species are similar in many respects to the members of the subgenus *Epaphiopsis* (s. str.) occurring in the area on the Pacific side of Central Japan (cf. UÉNO, 1962), but are definitely different from them in certain important features and require a subgenus of their own for their reception.

In the present paper, I am going to describe or redescribe all the hitherto known species of *Epaphiopsis* from Taiwan, and to erect a new subgenus, *Formosiellus*, for receiving them. The abbreviations used in this article are as follows: HW – greatest width of head, including eyes; PW – greatest width of pronotum; PL – length of pronotum, measured along the mid-line; PA – width of pronotal apex; PB – width of pronotal base; EW – greatest width of elytra; EL – greatest length of elytra; M – arithmetic mean; NSMT – Department of Zoology, National Science Museum (Nat. Hist.), Tokyo; ENMP – Entomologické Oddělení, Národní Muzeum v Praze.

Before going into further details, I wish to express my hearty thanks to Drs. Zdeněk MLYNÁŘ and Josef JELÍNEK for giving me the privilege of re-examining the type specimen of *Tasmanorites formosanus* JEDLIČKA. Deep indebtedness should also be expressed to the following friends of mine, whose kind help enabled me to complete the present paper: Dr. Hiroyuki MORIOKA, Dr. Ryôsuke ISHIKAWA, Dr. Katsuyuki TERADA, Messrs. Sumao KASAHARA, Yasutoshi SHIBATA and Yasuaki WATANABE.

Subgenus *Formosiellus* S. UÉNO, nov.

[JEDLIČKA, in litt.]

Type species: *Tasmanorites formosanus* JEDLIČKA, 1946.

Basically similar to *Epaphiopsis* S. UÉNO (s. str.) (1953, p. 32, 1962, p. 43), but differing from it mainly in the glabrous genae and the presence of the preapical pore on elytra.

Body glabrous on dorsum except for pronotum, which is more or less pubescent; venter more or less pubescent; depigmented and devoid of hind wings. Head wider than long, with deep entire frontal furrows which are not angulate at middle or very obtusely so; eyes flat or only feebly convex, variable in size though always faceted; genae tumid, either completely or practically glabrous, with a few isolated hairs at the

most; labrum widely emarginate at apex; mandibles stout, with a distinct premolar tooth on the right one; mentum tooth porrect, either truncated or slightly cleft at the tip; palpi short and stout, with penultimate segments widely dilated towards apices and surmounted with conical apical segments; antennae stout, subfiliform. Pronotum either cordate or suborbicular, more or less pubescent on the surface; sides entirely bordered, widely arcuate, and very briefly sinuate close to hind angles, which are always denticulate; two pair of marginal setae present as usual; postangular carinae either absent or very obtuse.

Elytra either oval or ovate, with reflexed side borders complete to the base of stria 5 or to its site; striae distinctly impressed on the disc but more or less degenerated at the side and often also near the base, stria 2 usually forming apical anastomosis with stria 3, on which lies the preapical pore, but sometimes extending to apex without forming apical anastomosis, stria 8 deeply impressed in apical half; scutellar striole distinct; apical striole deeply impressed though not long, either free at the anterior end or joining stria 5, rarely directed to the site of stria 7; internal dorsal series composed of one to nine setiferous pores usually situated on stria 3; external dorsal series composed of two to seven setiferous pores usually situated on stria 5; marginal series of umbilicate pores perfectly aggregated.

Ventral surface more or less pubescent, at least at the median part of each segment; anal sexual setae normal. Legs moderate; protibiae either straight or slightly arcuate, gently dilated towards apices, longitudinally grooved on the external face, and glabrous on the anterior face; tarsi fairly thick, segment 4 with a long ventral apophysis in pro- and mesotarsi; in ♂, two proximal segments of each protarsus widely dilated, stoutly produced inwards at apices, and furnished beneath with sexual adhesive appendages.

Male genitalia small; aedeagus variable in configuration, more or less arcuate, usually with large basal bulb and short apical lobe, but in *E. divarboris* sp. nov., the apical lobe is long and protruding; basal orifice very large and ventrally open in the species of the *multipunctata* group, relatively small and open at the posterior face of basal bulb in the species of the *formosana* group; sagittal aileron usually absent, rudimentary even if present; inner sac often wholly scaly though the scales are hardly or very lightly sclerotized, armed usually with an elongate copulatory piece, which is sometimes twofold at the proximal part and often partially covered with a compact mat of minute sclerotized teeth; in *E. divarboris*, copulatory piece broadly spatulate and horizontally bicornuate at the apex; styles usually short and broad, ventral apophysis of left style either absent or inconspicuous in most species, each bearing three or four (rarely five) stout setae at the apex.

Range. Endemic to the Island of Taiwan.

Notes. Trechine beetles belonging to the genus *Epaphiopsis* have been classified into four subgenera, *Epaphiopsis* (s. str.), *Pseudepaphius* S. UÉNO (1962, p. 70), *Epaphiama* JEANNEL (1962, pp. 175, 188; UÉNO, 1978, p. 125) and *Allepaphiama* S. UÉNO et PAWŁOWSKI (1983, p. 142). Of these, the first two are endemic to Japan (cf.

fig. 1 in UÉNO, 1978, p. 124, and fig. 2 in UÉNO, 1988, p. 36); the third is distributed in southwestern Hokkaido of Northeast Japan and the Soviet Far East, and is recently recorded also from the southwestern Altai (*E. jacobsoni* SOKOLOV et SHILENKOV, in SHILENKOV & SOKOLOV, 1987, p. 102, figs. 1–6), a distributional pattern somewhat similar to that shown by grylloblattids (cf. STOROZHENKO & OLIGER, 1984); the last one is known from the Singalila Dara on the borders of East Nepal and West Bengal in the eastern Himalayas and probably occurs also in Sichuan in central China.²⁾ This pattern of distribution clearly shows that like many of the East Asian trechines, the genus originated in Mainland China and radiated from there (cf. UÉNO, 1982), although its members have not been satisfactorily known from China, with the exception of *Tienmutrechus dispersipunctis* SUENSON (1957, p. 91, pl. 1 lower right; UÉNO, 1976, p. 126, figs. 1–3), which can be regarded as a prototype of *Epaphiopsis*.

The affinity of *E. formosana* (JEDLIČKA) from Taiwan has not been clarified until now since it was transferred from *Tasmanorites* to *Epaphiopsis* (UÉNO, 1962, p. 43), and the species was regarded by CASALE and LANEYRIE (1982, p. 81) as a “species incertae sedis.” However, JEDLIČKA himself seems to have become aware of his original error, because the type specimen of *Tasmanorites formosanus* bears a pink label inscribed with “*Formosiellus formosanus* sp. n.” in his handwriting. The genus “*Formosiellus*” was never described, and therefore there is no way to consult JEDLIČKA’s opinion about its relationship. To the memory of his contribution, however, I have adopted his new name for the new subgenus of *Epaphiopsis* endemic to Taiwan.

As was pointed out at the beginning of the description given above, *Formosiellus* is most closely similar to *Epaphiopsis* (s. str.), because of the archaic state of the elytral chaetotaxy and the characteristic pattern of pubescence on the body surface. There is, however, a definite difference between the two in the presence or absence of the preapical pore on the apical declivity of elytra, and in this respect, the Taiwanese subgenus can be said a little more advanced than the Japanese. On the other hand, Taiwanese species are less homologous than Japanese ones both in morphological features and in the mode of speciation, and are classified into two lineages. One of them, to be called the *multipunctata* group, comprises five new species which can be discriminated from one another at first sight. The other, to be called the *formosana* group, also comprises five species including JEDLIČKA’s one, but their speciation is still at the sibling stage and their classification can be confidently made only on the basis of genitalic characters. Since the two lineages of species are distributed in parallel

2) The two Chinese species recently described by DEUVE (1988, pp. 256–259) under the names “*Epaphiama budhaicus*” and “*E. perreai*” may probably belong to the subgenus *Allepaphiama*, though the internal dorsal series of elytra consists of only two setiferous pores. His descriptions and illustrations clearly show that the preapical pore lies on the 2nd stria before the apical declivity of elytra, not on the apical anastomosis of the 2nd and 3rd striae on the apical declivity. For this reason, they cannot be regarded as belonging to the subgenus *Epaphiama*. Besides, this arrangement better reflects the distributional pattern of trechine beetles in East Asia. DEUVE referred neither to my revision of *Epaphiama* (1978) nor to the description of *Allepaphiama* (1983), the contributions that are indispensable for dealing with trechine beetles of the *Epaphiopsis* group.

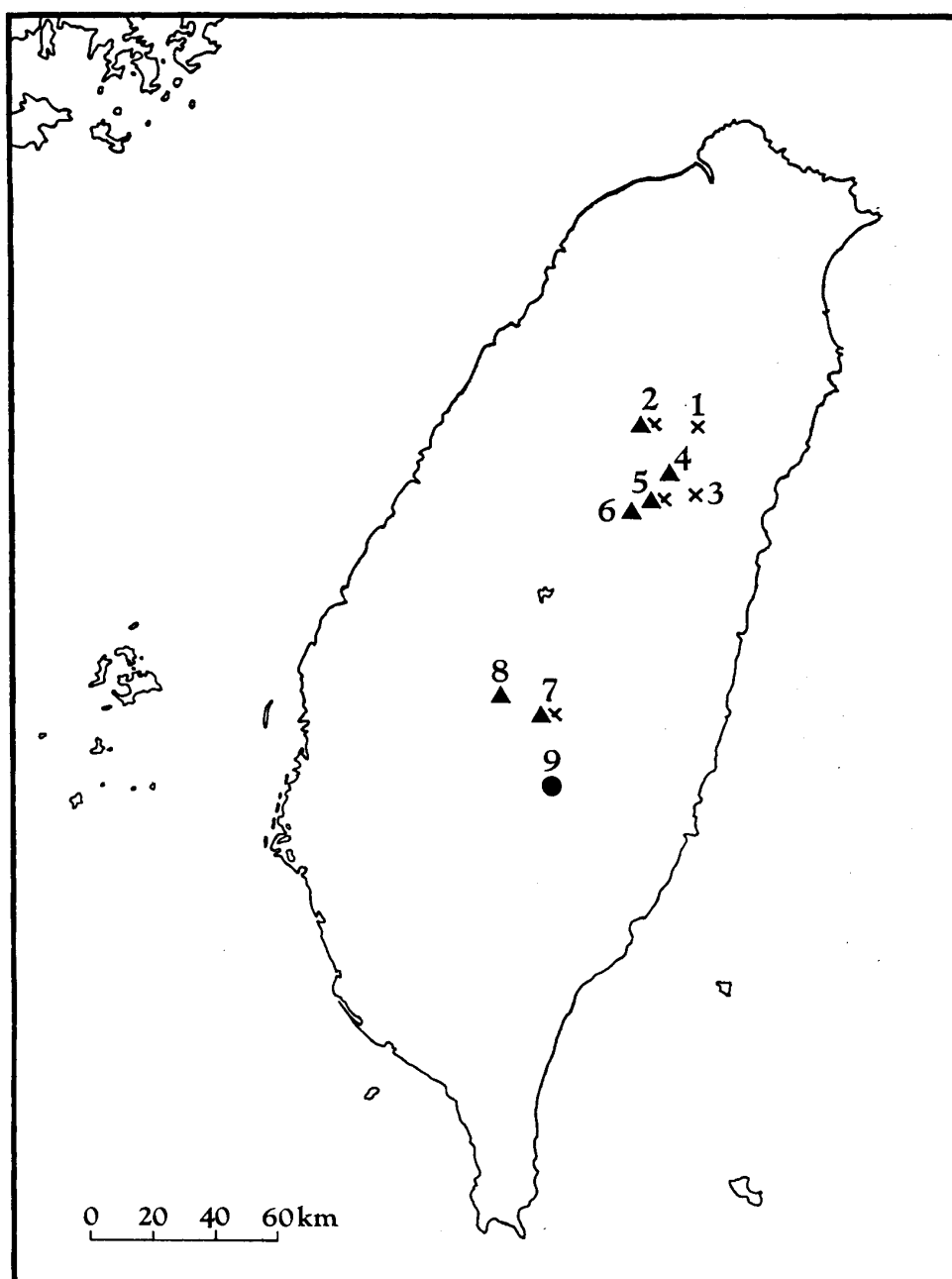


Fig. 1. Map showing the known localities of *Epaphiopsis* and *Trechiama* in Taiwan. Cross marks: Group of *Epaphiopsis multipunctata*. Black triangles: Group of *E. formosana*. Black circle: *Trechiama*. — 1, Mt. Nan-hu-ta Shan (*E. multipunctata* sp. nov.); 2, Mt. Hsüeh Shan (*E. elegans* and *E. hsuehshana* spp. nov.); 3, Pi-lu (*E. divarboris* sp. nov.); 4, Sung-ch'uan-kang and Pi-lu Ch'i (*E. shibatai* sp. nov.); 5, Mt. Ho-huan Shan (*E. kasaharai*, *E. shibatai* and *E. alticola* spp. nov.); 6, Ts'ui-feng (*E. shibatai* sp. nov.); 7, Yü Shan Mts. (*E. yushana* and *E. apiceplana* spp. nov.); 8, A-li Shan Mts. (*E. formosana* (JEDLIČKA)); 9, T'ien-ch'ih and Ya-k'ou (*Trechiama alatus* S. UÉNO).

with each other on the central high mountains of Taiwan, their specific differentiation must have taken place under the same environmental condition. It is therefore probable that the difference between them was caused by different histories, and the ancestors of the *multipunctata* group may have spread over Taiwanese mountains prior to those of the *formosana* group.

It seems worth noting that certain species of the *multipunctata* group (e.g., *E. multipunctata* and *E. kasaharai*) bear a remote resemblance in habitus to small species of *Trechiana*. Needless to say, facial similarity cannot be regarded as a positive proof of relationship, but in this particular case, the resemblance arouses considerable interest, since the two genus-groups, that of *Epaphiopsis* and that of *Trechiana*, must have been derived from a common ancestor as is indubitably indicated by other evidences. Further link between the two groups will doubtless be found when the trechine fauna of Mainland China is better known in the future.

Key to the Species

- 1 (10) Elytral stria 3 with more than one (two to nine, usually three or more) setiferous dorsal pores [group of *E. multipunctata*].
- 2 (7) Hind body more or less flattened; prothorax small and cordate.
- 3 (6) Colour lighter, yellowish brown to light reddish brown; body more flattened.
- 4 (5) Elytra wider (EL/EW less than 1.50) and less depressed on the disc; Mt. Nan-hu-ta Shan.....*E. multipunctata* sp. nov.
- 5 (4) Elytra narrower (EL/EW more than 1.50) and more depressed on the disc; Mt. Ho-huan Shan.....*E. kasaharai* sp. nov.
- 6 (3) Color darker, dark reddish brown; body less flattened; Mt. Hsüeh Shan ...
.....*E. elegans* sp. nov.
- 7 (2) Hind body strongly convex on dorsum.
- 8 (9) Smaller (less than 4.00 mm in body length); prothorax smaller, transverse subcordate; elytral striae shallower on the disc; Mt. Yü Shan
.....*E. yushana* sp. nov.
- 9 (8) Larger (more than 4.00 mm in body length); prothorax larger, almost sub-orbicular; elytral striae deeper on the disc; Pi-lu east of Ta-yu-ling.....
.....*E. divarboris* sp. nov.
- 10 (1) Elytral stria 3 with a single setiferous dorsal pore near base [group of *E. formosana*].
- 11 (18) Colour dark reddish brown, sometimes with lighter hind body; pronotal disc more densely, though sparsely, pubescent.
- 12 (15) Aedeagal apical lobe not rod-like in lateral view; copulatory piece shorter, less than one-third as long as aedeagus.
- 13 (14) Pronotal front angles rounded; aedeagus not flattened, abruptly narrowed from behind apical orifice, especially in lateral view; copulatory piece larger, about one-third as long as aedeagus; A-li Shan Mts.

-*E. formosana* (JEDLIČKA).
- 14 (13) Pronotal front angles obtusely angulate; aedeagus flattened and gradually narrowed towards apex, especially in lateral view; copulatory piece smaller, only one-fifth as long as aedeagus; Yü Shan Mts.
.....*E. apiceplana* sp. nov.
- 15 (12) Aedeagal apical lobe produced into a parallel-sided rod-like process in lateral view; copulatory piece more elongate, about two-fifths as long as aedeagus.
- 16 (17) Aedeagus only feebly arcuate, with apical lobe more or less curved ventrad; Ho-huan Shan Mts., incl. Ts'ui-feng, Sung-ch'uan-kang and Pi-lu Ch'i ...
.....*E. shibatai* sp. nov.
- 17 (16) Aedeagus strongly arcuate, with apical lobe distinctly curved dorsad and dorsally thickened at the terminal portion; Mt. Ho-huan Shan
.....*E. alticola* sp. nov.
- 18 (11) Concolorously light reddish brown; pronotal disc scantily pubescent; Mt. Hsüeh Shan.....*E. hsuehshana* sp. nov.

***Epaphiopsis (Formosiellus) multipunctata* S. UÉNO, sp. nov.**

(Figs. 2–4)

Length: 3.75–3.80 mm (from apical margin of clypeus to apices of elytra).

Body elongate and depressed; fore-body small, hind body fairly ample; appendages relatively slender. Colour concolorously yellowish brown, shiny, with palpi and apical segments of antennae somewhat paler.

Head small, wider than long, and depressed above, with deep frontal furrows widely divergent posteriad; frons and supraorbital areas gently convex; microsculpture mostly formed by polygonal meshes, though partially degenerated; eyes flat; genae tumid, about two-thirds as long as eyes, either completely glabrous or bearing one or two minute hairs; neck fairly wide, with the anterior constriction sharply marked at the sides; palpi short and thick, with subulate apical segments; antennae short and fairly stout, reaching basal three-tenths of elytra, segment 2 about four-fifths as long as one of the following segments, which is subcylindrical and a little more than twice as long as wide, segments 7–10 each oval, broader than the precedings and less than twice as long as wide, terminal segment the longest though narrower than scape, about three-fifths as wide as the latter.

Pronotum small though evidently wider than head, cordate, moderately convex on dorsum, widest at about two-thirds from base, and more straightly narrowed towards base than towards apex; PW/HW 1.28–1.35, PW/PL 1.22–1.27, PW/PA 1.47–1.50, PW/PB 1.47–1.55; surface sparsely pubescent, microsculpture formed by fine transverse lines though partially degenerated; sides rather widely reflexed, well rounded in front but feebly arcuate in basal halves, and very briefly but deeply sinuate just before hind angles, each of which is formed by a somewhat sharp denticle produced either laterally or postero-laterally; apex very slightly emarginate, as wide as

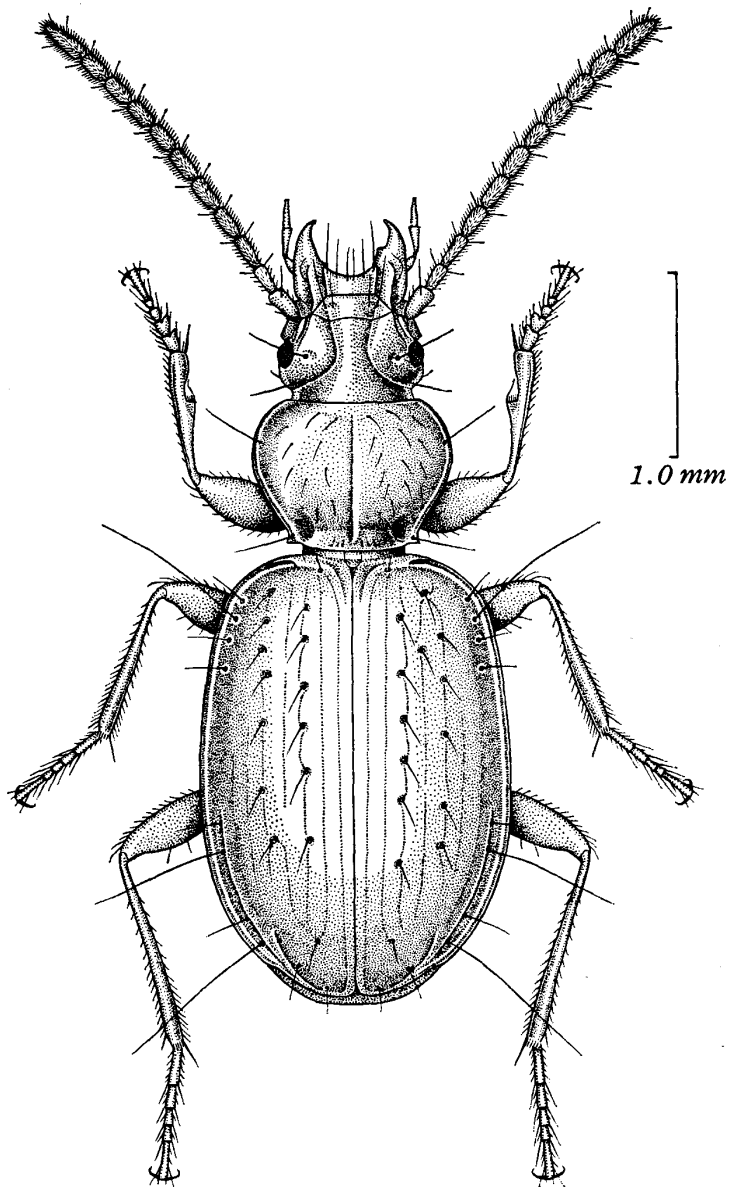


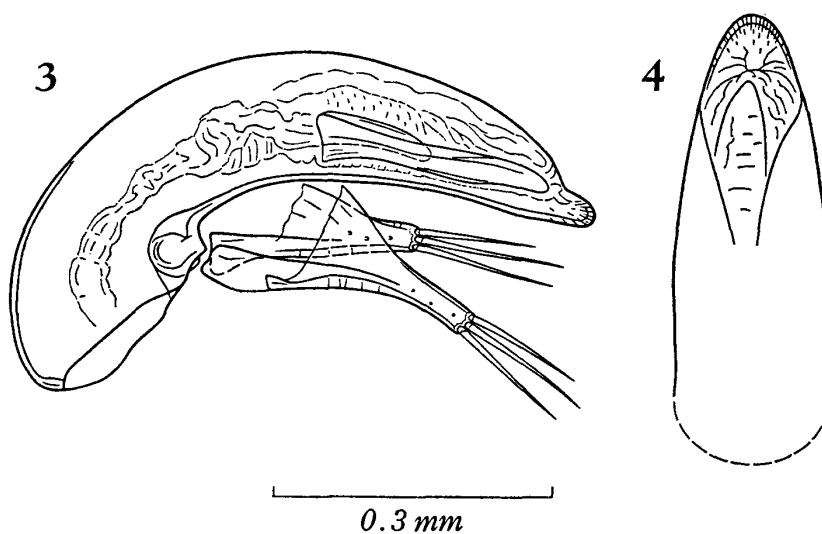
Fig. 2. *Epaphiopsis* (*Formosiellus*) *multipunctata* S. UÉNO, sp. nov., ♂, from Mt. Nan-hu-ta Shan.

or slightly wider than base, PB/PA 0.96–1.00, with front angles rounded off; base slightly arcuate for the most part but distinctly, though briefly, emarginate on each side close to hind angle; median line sharply impressed, reaching neither apex nor base, though widened in basal area; apical transverse impression vague, irregularly wrinkled; basal transverse impression mal-defined, laterally merging into basal foveae, which are not large but fairly deep, smooth at the bottoms, and extend anteriorly along side borders; postangular carinae very obtuse; basal area narrow, longitudinally strigose.

Elytra ovate, much wider than pronotum, widest at about or a little behind middle, and more gradually narrowed towards bases than towards apices; EW/PW 1.53–1.64, EL/EW 1.47; surface moderately convex at the sides but widely depressed on the disc, with steep apical declivity; microsculpture mostly obliterated though consisting of fine transverse lines; shoulders distinct though widely rounded, with regularly arcuate prehumeral borders whose innermost portions are perpendicular to the mid-line; sides moderately reflexed throughout, feebly arcuate in front, moderately and evenly so behind the widest part, and almost conjointly rounded at apices though forming a very small re-entrant angle at suture, each with a shallow preapical emargination; striae superficial, shallowly impressed and indistinctly crenulate even on the disc, nearly obsolete at the side, striae 1–3 entire, 4–5 distinct on the disc but more or less obliterated near base, 6–7 barely traceable at middle, and 8 disappearing in front; scutellar striole not long but distinct; apical striole deeply impressed, rather feebly curved, and directed to the site of stria 7; intervals flat even near suture; apical carina distinct; setiferous dorsal pores large and somewhat foveolate, internal series composed of five or six pores, external series composed of four to seven pores, an extra pore present on stria 4 of right elytron in the holotype; preapical pore situated at the apical anastomosis of striae 2 and 3, and a little more distant from apex than from suture.

Ventral surface sparsely pubescent at the median parts of respective segments. Legs relatively slender; protibiae slightly arcuate in apical parts; tarsi not long.

Male genital organ very small and rather lightly sclerotized. Aedeagus only a little less than two-sevenths as long as elytra, short, broad, and moderately arcuate, with the dorsal margin semicircularly rounded in profile and the dorsal surface not



Figs. 3–4. Male genitalia of *Epaphiopsis* (*Formosiellus*) *multipunctata* S. UÉNO, sp. nov., from Mt. Nan-hu-ta Shan; left lateral view (3), and apical part of aedeagus, dorso-apical view (4).

widely membranous; basal part fairly large, with large basal orifice whose sides are hardly emarginate; sagittal aileron absent; apical lobe very short, symmetrical and widely rounded at the tip in dorsal view, very slightly reflexed and narrowly rounded at the tip in lateral view; ventral margin widely emarginate at middle in profile. Inner sac armed with a twofold copulatory piece but devoid of sclerotized teeth or scales; copulatory piece elongate, about two-fifths as long as aedeagus, lying obliquely, and blunt at the apex, with an accessory sclerite at the right side of the proximal part, which is nearly a half as long as the main sclerite and blunt at the apex. Styles fairly slender, left style obviously longer than the right and devoid of ventral apophysis, each bearing three or four stout setae at the apex.

Female unknown.

Type series. Holotype: ♂, paratype: 1 ♂, 18-VI-1961, S. UÉNO leg. Deposited in the collection of the Department of Zoology, National Science Museum (Nat. Hist.), Tokyo.

Type locality. Mt. Nan-hu-ta Shan, Nan-hu Ch'i, 3,250 m alt., in T'ai-chung Hsien, Taiwan.

Notes. This is a remarkable new species readily recognized on its light coloration, elongate and depressed habitus with small fore-body, cordate prothorax, and the presence of numerous setiferous dorsal pores on both the 3rd and 5th striae of elytra. With the exception of *E. kasaharai* to be described on later pages, it is unique in its facies, which remind us of certain small species of *Trechiana* (e.g., *T. minutus* S. UÉNO, 1971, pp. 8, 12, figs. 8–10). It is designated as the type of a species-group, which is mainly characterized by possession of more than one (two to nine, usually three or more) setiferous dorsal pores on the 3rd elytral stria. Besides *E. multipunctata* and *E. kasaharai*, three more species have been known to belong to the same species-group, but they are considerably variable in facies and one of them (*E. divarboris*) looks like a member of the *formosana* group.

The two known specimens of *E. multipunctata* were found in a shaded spot near the source of the Nan-hu Ch'i River on the northern slope of Mt. Nan-hu-ta Shan (3,740 m in height). They were dug out from under large stones embedded in the soil near the edge of a narrow stream. This kind of habitat is rather exceptional for a species of *Formosellus*, since almost all the others exclusive of *E. kasaharai* live under mosses or in litter deposits on humid forest floors.

***Epaphiopsis (Formosellus) kasaharai* S. UÉNO, sp. nov.**

(Fig. 5)

Length: 3.70–3.95 mm (from apical margin of clypeus to apices of elytra).

Recognized at first sight on its elongate body unusually depressed on dorsum, more remarkably flattened than in *E. multipunctata*; fore body small, hind body elongate; appendages slender though not particularly long. Colour concolorously light reddish brown, shiny, very faintly iridescent on elytra, with palpi and apical seg-

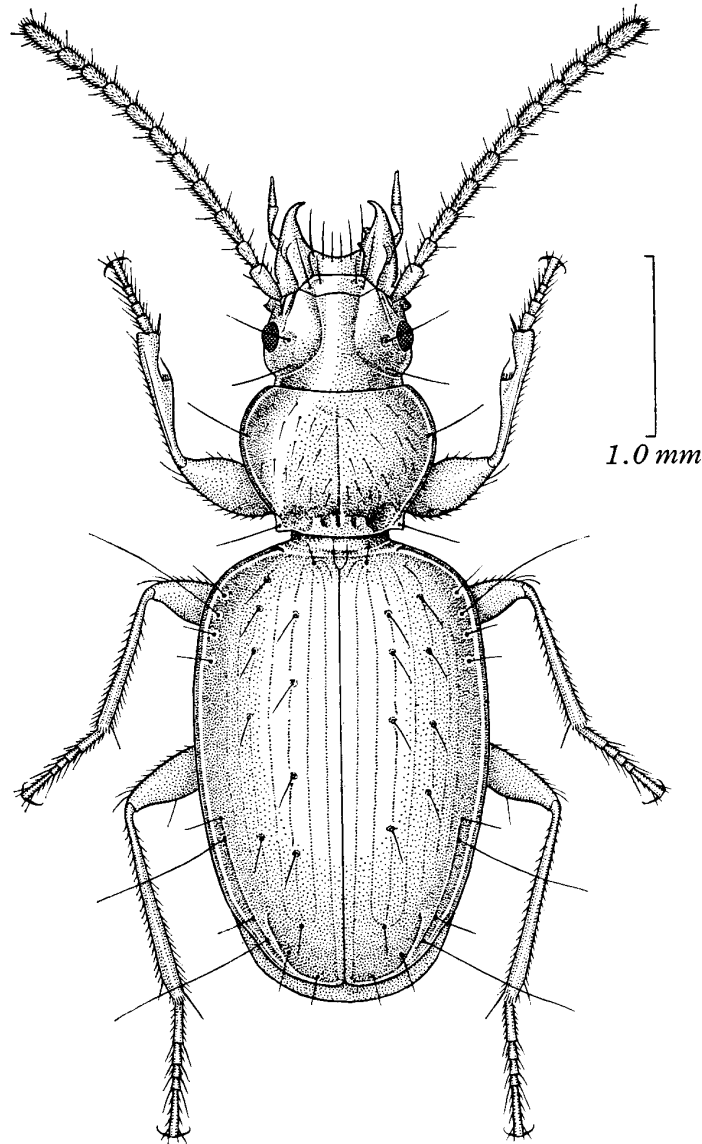


Fig. 5. *Epaphiopsis (Formosiellus) kasaharai* S. UÉNO, sp. nov., ♀, from Mt. Ho-huan Shan.

ments of antennae somewhat paler.

Head as in *E. multipunctata* though more depressed and a little wider at the neck; genae slightly less convex; antennae somewhat shorter and slanderer, reaching or extending slightly beyond basal fourth of elytra (this may be due to sexual difference). Pronotum similar to that of *E. multipunctata*, but less convex especially in anterior half, widest at about five-eighths from base, and usually a little more contracted at base, which is almost straight at middle, with the sides more regularly arcuate behind the widest part; apex always a little wider than base; PW/HW 1.27–1.31 (M 1.29), PW/PL 1.18–1.25 (M 1.21), PW/PA 1.44–1.49 (M 1.47), PW/PB 1.54, PB/PA 0.93–0.96 (M 0.95).

Elytra elongated oval or ovate, remarkably depressed especially on the disc, widest at about middle, and more gradually narrowed towards bases than towards apices; EW/PW 1.53–1.55 (M 1.54), EL/EW 1.51–1.57 (M 1.54); shoulders widely rounded, with prehumeral borders somewhat more oblique than in *E. multipunctata*; sides feebly arcuate even behind middle, almost conjointly rounded at apices, which form a small re-entrant angle at suture, each with a slight preapical emargination; striae a little more clearly impressed than in *E. multipunctata*, 4–5 almost entire, 6–7 and even anterior part of 8 mostly traceable; scutellar striole short but distinct; apical striole short but deep, moderately curved, and joining or almost joining stria 5; intervals 1–3 slightly convex, others flat; setiferous dorsal pores large and somewhat foveolate, internal series composed of four or five (usually four) pores, external series also composed of four or five pores; preapical pore as in *E. multipunctata*.

Ventral surface rather densely pubescent except for the lateral parts of respective segments. Legs fairly slender; protibiae almost straight.

Male unknown.

Type series. Holotype: ♀, 9–VI–1987, S. KASAHARA leg. Paratypes: 1 ♀, 28–III–1987, Y. SHIBATA leg.; 1 ♀, 9–VI–1987, S. KASAHARA leg. All deposited in the collection of the Department of Zoology, National Science Museum (Nat. Hist.), Tokyo.

Type locality. Mt. Ho-huan Shan, 3,100 m alt., in Nan-t'ou Hsien, Taiwan.

Notes. This distinctive new species can be recognized on its narrow depressed habitus alone. Its true affinity is not certain due to lack of males, but the light coloration and the depressed body suggest its relationship to *E. multipunctata*.

All the known specimens of *E. kasaharai* were found in the alpine zone on the eastern slope of Mt. Ho-huan Shan (3,416 m in height), which lies about 30 km south-west of Mt. Nan-hu-ta Shan, the type locality of *E. multipunctata*. KASAHARA's specimens are said to have been dug out from crevices of weathered rock, while SHIBATA's one was taken from under a stone lying in a wet place. None of them coexisted with *E. alticola*, an alpine species of the *formosana* group, which is also endemic to Mt. Ho-huan Shan.

***Epaphiopsis (Formosiellus) elegans* S. UÉNO, sp. nov.**

(Figs. 6–8)

Length: 3.80–4.40 mm (from apical margin of clypeus to apices of elytra).

Distinguished at first sight from the two preceding species by its dark coloration and less flattened body. Elongate and depressed, though obviously less flattened than in the two preceding species. Colour dark reddish brown, shiny, faintly iridescent on elytra; palpi, apical halves of antennae, epipleura and legs more or less lighter than dorsum.

Head as in *E. multipunctata*; eyes variable in size though always flat; genae five-ninths to six-sevenths as long as eyes; microsculpture clearly impressed throughout,

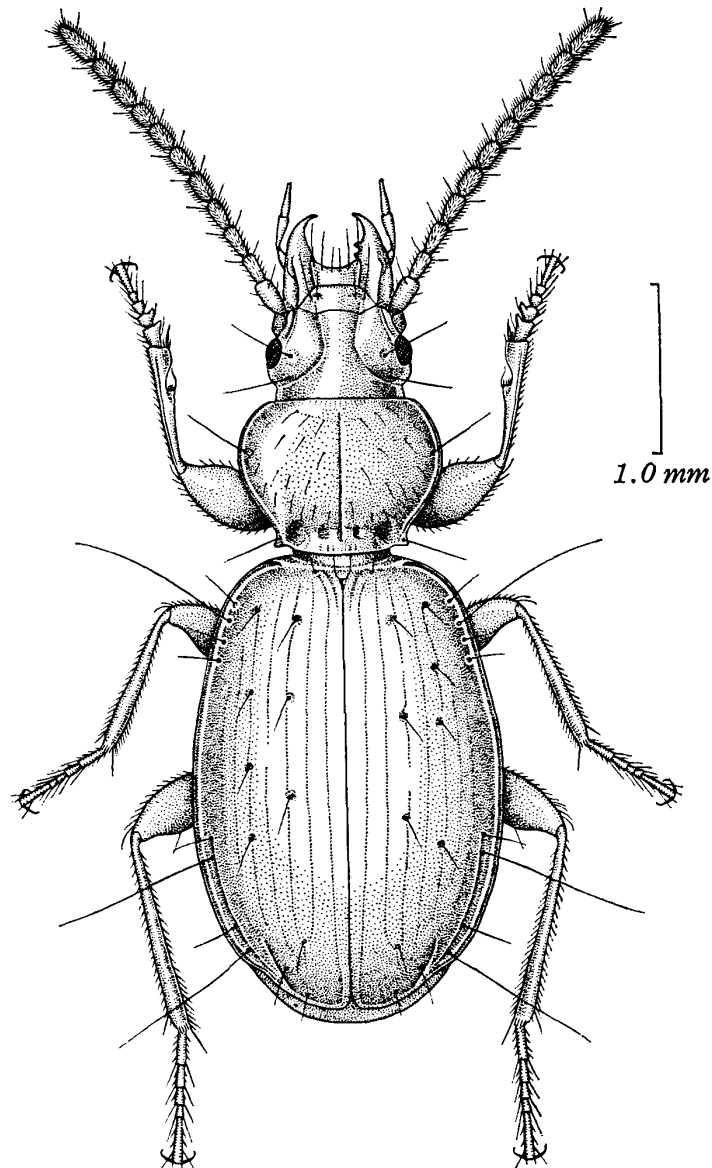


Fig. 6. *Epaphiopsis (Formosiellus) elegans* S. UENO, sp. nov., ♂, from Mt. Hsüeh Shan.

mostly consisting of wide meshes; neck wide; palpi relatively slender; antennae fairly thick, reaching or nearly reaching basal fourth of elytra. Pronotum cordate, larger and more evenly convex on dorsum than in *E. multipunctata*, widest at about three-fifths from base, and more gradually narrowed towards base than towards apex; PW/HW 1.33–1.44 (M 1.38), PW/PL 1.18–1.30 (M 1.23), PW/PA 1.45–1.59 (M 1.51), PW/PB 1.40–1.55 (M 1.47); surface moderately and evenly convex, sparsely pubescent, microsculpture mostly distinct, consisting of fine transverse lines; sides moderately arcuate in front, feebly so behind middle, and very briefly sinuate just before hind angles, which are usually a little sharp and postero-laterally produced but sometimes rec-

tangular and not denticulate; apex slightly narrower than base in most individuals but sometimes as wide as or even slightly wider than the latter, PB/PA 0.97–1.08 (M 1.03); median line reaching base; other pronotal features as in *E. multipunctata*.

Elytra ovate, widest at about middle, and more gradually narrowed towards bases than towards apices; EW/PW 1.45–1.57 (M 1.51), EL/EW 1.43–1.52 (M 1.48); surface longitudinally depressed on the disc but convex at the sides and in apical areas, apical declivity steep; microsculpture formed by fine transverse lines though largely degenerated; shoulders rounded, with prehumeral borders feebly arcuate and somewhat oblique at the innermost portions; sides moderately reflexed throughout, feebly arcuate in front, more strongly so behind, and almost conjointly rounded at apices, which form a very small re-entrant angle, each with a slight preapical emargination; striae and scutellar striae as in *E. multipunctata*, though the striae 4–5 are usually complete to the bases; apical striae deeply impressed, rather feebly curved, usually joining or almost joining stria 5 but sometimes directed to the site of stria 7; intervals slightly convex only near suture; apical carina distinct; setiferous dorsal pores large and somewhat foveolate, internal series composed of two to five (usually three or four) pores, external series composed of three to five (usually four or five) pores; preapical pore situated at the apical anastomosis of striae 2 and 3, and obviously more distant from apex than from suture.

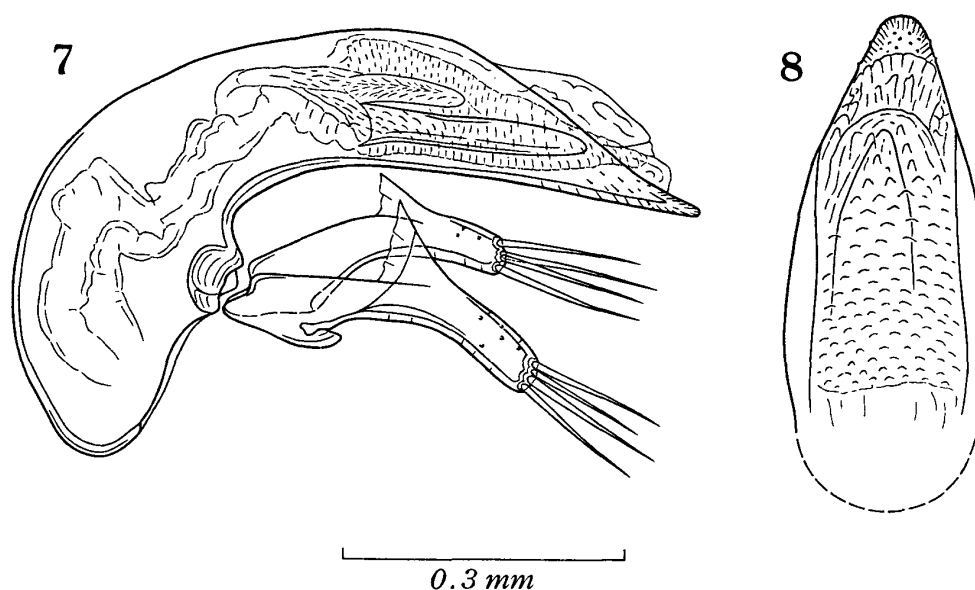
Ventral surface sparsely pubescent at the median parts of respective segments. Legs fairly stout; protibiae almost straight.

Male genital organ very small and rather lightly sclerotized. Aedeagus about two-sevenths as long as elytra, short, depressed, moderately arcuate at middle, and widely membranous on the dorsal surface, with the dorsal margin semicircularly rounded before middle in profile; basal part very large, fairly elongate, and rather strongly curved ventrad, with large basal orifice whose sides are slightly emarginate at the posterior parts; no sagittal aileron; apical part rather gradually narrowed towards apex, with short symmetrical apical lobe, which is broad subtriangular and widely but not evenly rounded at the tip in dorsal view, narrow and blunt at the tip in lateral view; ventral margin distinctly emarginate before middle in profile but almost straight in apical part. Inner sac wholly scaly and armed with an elongate twofold copulatory piece; scales lightly sclerotized only at the proximal part of inner sac; copulatory piece elongate, nearly one-third as long as aedeagus, and blunt at the apex, with a hyaline accessory sclerite less than a half as long as the main piece. Styles fairly large and broad, left style much longer than the right and with a short ventral apophysis, each bearing three or four stout setae at the apex.

Type series. Holotype: ♂, allotype: ♀, 22–VI–1961 (3,300–3,500 m alt.), S. UÉNO leg. Paratypes: 17 ♂♂, 2 ♀♀, 22–VI–1961 (3,300–3,500 m alt.), S. UÉNO leg.; 1 ♂, 23–VI–1961 (3,500 m alt.), S. UÉNO leg. All deposited in the collection of the Department of Zoology, National Science Museum (Nat. Hist.), Tokyo.

Type locality. Mt. Hsüeh Shan, 3,300–3,500 m alt., in T'ai-chung Hsien, Taiwan.

Notes. Though considerably different in general appearance, this new species



Figs. 7-8. Male genitalia of *Epaphiopsis* (*Formosiellus*) *elegans* S. UÉNO, sp. nov., from Mt. Hsüeh Shan; left lateral view (7), and apical part of aedeagus, dorso-apical view (8).

seems most closely related to *E. multipunctata*. This view is supported by similarity of the inner armature of male genitalia.

The type locality of the present species, Mt. Hsüeh Shan (3,884 m in height), is the second highest mountain in the Island of Taiwan. It lies only 20 km west by north of Mt. Nan-hu-ta Shan, the type locality of *E. multipunctata*, but is separated from the latter by the valleys of the Ta-chia Ch'i and the I-lan-cho-shui Ch'i; the former mountain belongs to the Hsüeh-shan Range, while the latter to the Chung-yang Range. All the known specimens of *E. elegans* were taken by sifting thick moss-mats covering the floor of an *Abies* forest on the eastern slope of the high mountain.

***Epaphiopsis* (*Formosiellus*) *yushana* S. UÉNO, sp. nov.**

(Fig. 9)

Length: 3.85 mm (from apical margin of clypeus to apices of elytra).

Probably related to *E. multipunctata*, but strikingly different from it in the dark coloration, well convex dorsum, especially elytra, much wider neck, obviously larger and differently shaped prothorax, and narrower elytra with more degenerated striae.

Body elongate, convex on dorsum; fore-body small though not so small as in *E. multipunctata*; appendages short and stout. Colour dark brown, shiny, faintly iridescent on elytra; palpi pale; apical segments of antennae, epipleura, and legs somewhat lighter than dorsum.

Head more transverse and evidently wider at neck than in *E. multipunctata*, with frontal furrows subangulate at middle; eyes completely flat though distinctly faceted; genae relatively short, four-sevenths as long as eyes, and gently convex; neck con-

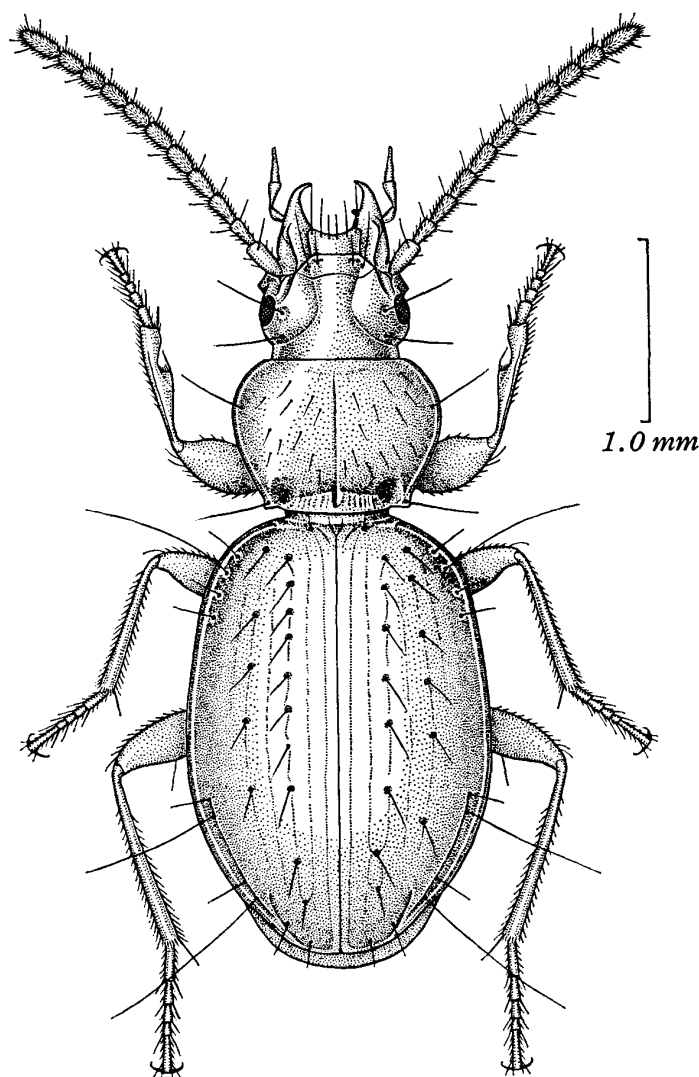


Fig. 9. *Epaphiopsis (Formosiellus) yushana* S. UÉNO, sp. nov., ♀, from Mt. Yü Shan.

striction relatively shallow and not very sharp; microsculpture sharply impressed throughout, mostly consisting of wide meshes; antennae short and stout, reaching basal fourth of elytra, middle segments subcylindrical, each about twice as long as wide, segments 7–10 subovoid, each also about twice as long as wide, terminal segment about as long as scape and about three-fourths as wide as the latter.

Pronotum transverse subcordate, much wider than head, wider than long, widest at about five-eighths from base, and more gradually narrowed towards base than towards apex; PW/HW 1.39, PW/PL 1.25, PW/PA 1.46, PW/PB 1.43; surface rather strongly convex, not depressed on the disc, and sparsely pubescent; microsculpture distinct, formed by fine transverse lines; sides moderately arcuate in front, feebly so behind and almost straight for a short distance before ante-basal sinuation, which is rather shallow though distinct; apex nearly as wide as base, PB/PA 1.02, with front

angles rounded off; base slightly arcuate, with a shallow emargination on each side close to hind angle; basal foveae small but deep, not extending anteriorly; other impressions as in *E. multipunctata*.

Elytra ovate, wider than prothorax, widest at about middle, and more gradually narrowed towards bases than towards apices; EW/PW 1.46, EL/EW 1.52; surface strongly and evenly convex, not depressed even near suture, with the apical declivity not very steep; microsculpture formed by fine transverse lines though largely degenerated; shoulders widely rounded, with prehumeral borders gently arcuate and somewhat oblique at the innermost portions; sides moderately reflexed throughout, almost straight behind shoulders, gently arcuate at middle, and conjointly rounded at apices, each with very slight preapical emargination; striae shallow even on the disc, obsolete altogether at the side, striae 1–2 entire, indistinctly crenulate, 3–5 obliterated in basal area, 6 only partially perceptible, 7 and anterior part of 8 effaced; scutellar striole short; apical striole short but deep, moderately curved, and free at the anterior end though directed to stria 5; intervals flat, apical carina obtuse; setiferous dorsal pores numerous and somewhat foveolate, internal series composed of seven (right) or nine (left) pores, external series composed of five (left) or six (right) pores; preapical pore situated at the apical anastomosis of striae 2 and 3, and evidently more distant from apex than from suture.

Ventral surface rather densely pubescent except for the lateral parts of respective segments. Legs short and stout; protibiae slightly arcuate in apical parts; tarsi fairly thick.

Male unknown.

Type specimen. Holotype: ♀, 20–V–1968, Y. WATANABE leg. Deposited in the collection of the Department of Zoology, National Science Museum (Nat. Hist.), Tokyo.

Type locality. Mt. Yü Shan, 3,450 m alt., in Chia-i Hsien, Taiwan.

Notes. It is difficult to determine the true affinity of this distinctive new species, since males are not available for the present study. Because of the convex body with fairly large prothorax, it is considerably different from the three preceding species and somewhat resembles *E. divarboris* to be described next. However, the size and shape of its prothorax is still nearer to those of the former three than to that of the latter, and the dark coloration is shared by both *E. elegans* and *E. divarboris*. For the time being, I prefer to place *E. yushana* next to *E. elegans*, but confirmation based upon males is needed.

Mt. Yü Shan (3,997 m in height), the type locality of *E. yushana*, is not only highest in Taiwan but higher than any of the high mountains in East Asia. It lies on a western branch of the Chung-yáng Mountain Range, and is about 113 km distant to the south-southwest from Mt. Nan-hu-ta Shan, the type locality of *E. multipunctata*, and about 83 km distant in the same direction even from Mt. Ho-huan Shan, the type locality of *E. kasaharai* and *E. alticola*. The single known specimen of *E. yushana* was sifted out from a heap of dead leaves accumulated at the side of a narrow stream

on the western slope of the main peak, together with two individuals of *E. apiceplana*.

Epaphiopsis (Formosiellus) divarboris S. UÉNO, sp. nov.

(Figs. 10–12)

Length: 4.20–4.60 mm (from apical margin of clypeus to apices of elytra).

An isolated species probably belonging to the *multipunctata* group, readily recognized on its relatively large body well convex on dorsum, large prothorax almost suborbicular in shape, long apical lobe of aedeagus, and horizontally spatulate copulatory piece with bicornuate apex.

Body elongate, fairly robust, and well convex on dorsum, with large prothorax and stout legs. Colour dark reddish brown, shiny, faintly iridescent on elytra; palpi pale; apical halves of antennae, ventral surface of hind body, and legs more or less lighter than dorsum.

Head a little wider than long, moderately depressed above, with deep frontal furrows widely divergent in front and behind; frons and supraorbital areas gently convex; microsculpture mostly formed by wide meshes, though partially degenerated; eyes flat; genae tumid, three-fifths to three-fourths as long as eyes, either completely glabrous or with one or two minute hairs; neck wide, with the anterior constriction deep at the sides; labrum rather shallowly emarginate at apex; palpi fairly slender, with penultimate segments moderately dilated towards apices and surmounted with elongated conical apical segments; antennae slender, reaching basal two-sevenths of elytra, segment 2 about four-fifths as long as segment 3, which is slightly longer than segment 4, each of the following segments subcylindrical and well more than twice as long as wide, terminal segment slightly longer than scape but about three-fourths as wide as the latter.

Pronotum large and ample, suborbicular rather than subcordate, much wider than head, wider than long, widest at about three-fifths from base, and almost equally narrowed in front and behind; PW/HW 1.46–1.53 (M 1.49), PW/PL 1.18–1.22 (M 1.20), PW/PA 1.54–1.58 (M 1.56), PW/PB 1.50–1.53 (M 1.51); surface strongly convex and sparsely pubescent; microsculpture formed by fine transverse lines though partially obliterated; sides narrowly but sharply reflexed throughout, widely arcuate from apex to just before base though the curvature is a little weaker behind middle, and very briefly but deeply sinuate just in front of hind angles, which are somewhat sharp and postero-laterally produced as denticles; apex slightly arcuate, very slightly narrower than base, PB/PA 1.02–1.03 (M 1.03), with front angles narrowly rounded; base nearly straight or slightly arcuate at middle, slightly emarginate on each side close to hind angle; median line sharply impressed, widening in basal area; apical transverse impression mal-defined, with longitudinal wrinkles; basal transverse impression continuous and fairly deep, laterally merging into basal foveae which are small but deep, and smooth at the bottom; postangular carinae very obtuse; basal area narrow, longitudinally strigose.

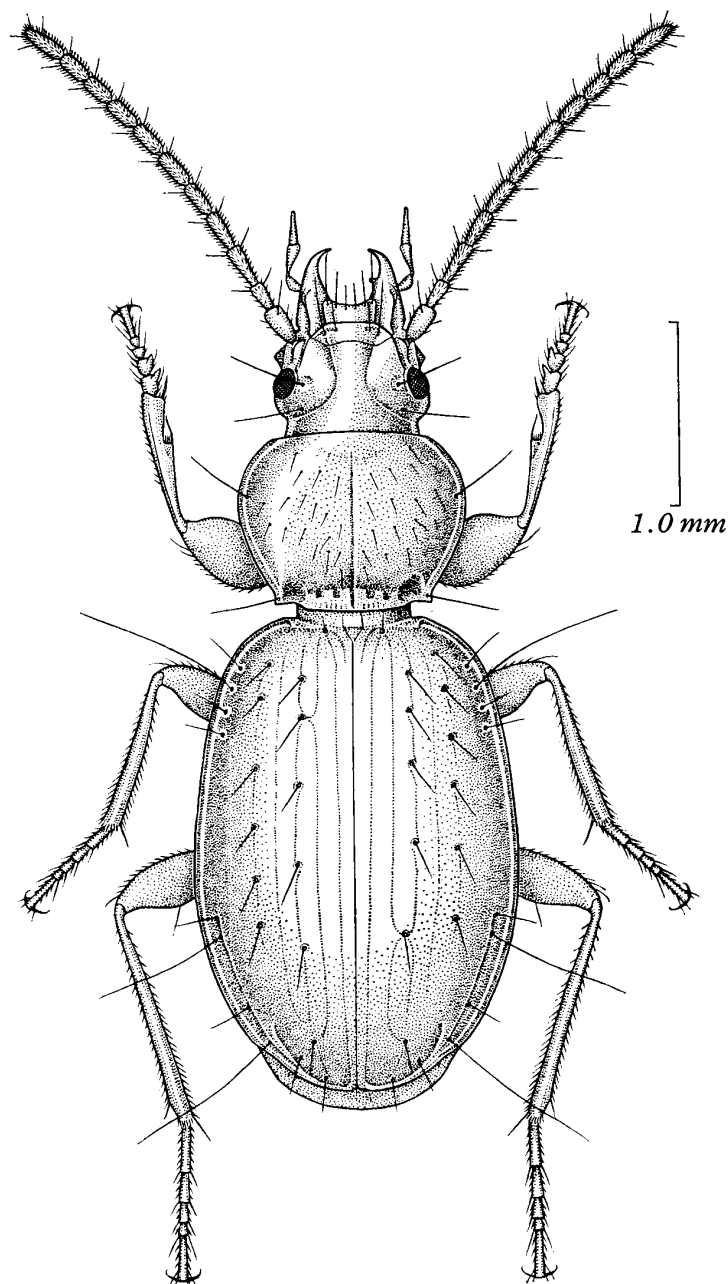


Fig. 10. *Epaphiopsis* (*Formosiellus*) *divarboris* S. UÉNO, sp. nov., ♂, from Pi-lu.

Elytra ovate, wider than pronotum, widest at about middle, and more gradually narrowed towards bases than towards apices; EW/PW 1.33–1.42 (M 1.38), EL/EW 1.47–1.51 (M 1.49); surface strongly convex though narrowly depressed near suture in basal three-fifths, with the apical declivity fairly steep; microsculpture mostly obliterated though consisting of fine transverse lines; shoulders distinct, with prehumeral borders feebly arcuate and almost perpendicular to the mid-line at the innermost portions; sides narrowly reflexed throughout, very feebly arcuate before middle, gently

so behind, and rather widely and almost conjointly rounded at apices, each with a very slight preapical emargination; striae deeply impressed and rather coarsely crenulate on the disc, but obsolete at the side, striae 1–4 usually entire, 5 shallower than inner ones and usually effaced at the two ends, 6 fragmentary and very slight even if perceptible, 7 and anterior part of 8 totally effaced; scutellar striole distinctly impressed; apical striole short but deep, feebly curved in front, and directed to the site of stria 7; intervals slightly convex on the disc, apical carina distinct though obtuse; setiferous dorsal pores not particularly large though somewhat foveolate, internal series composed of four or five (usually five) pores, external series composed of five to seven (usually six) pores; preapical pore situated at the apical anastomosis of striae 2 and 3, and slightly more distant from apex than from suture.

Ventral surface sparsely pubescent except for the lateral parts of respective segments. Legs relatively long though stout; protibiae almost straight and moderately dilated towards apices; tarsi fairly thin.

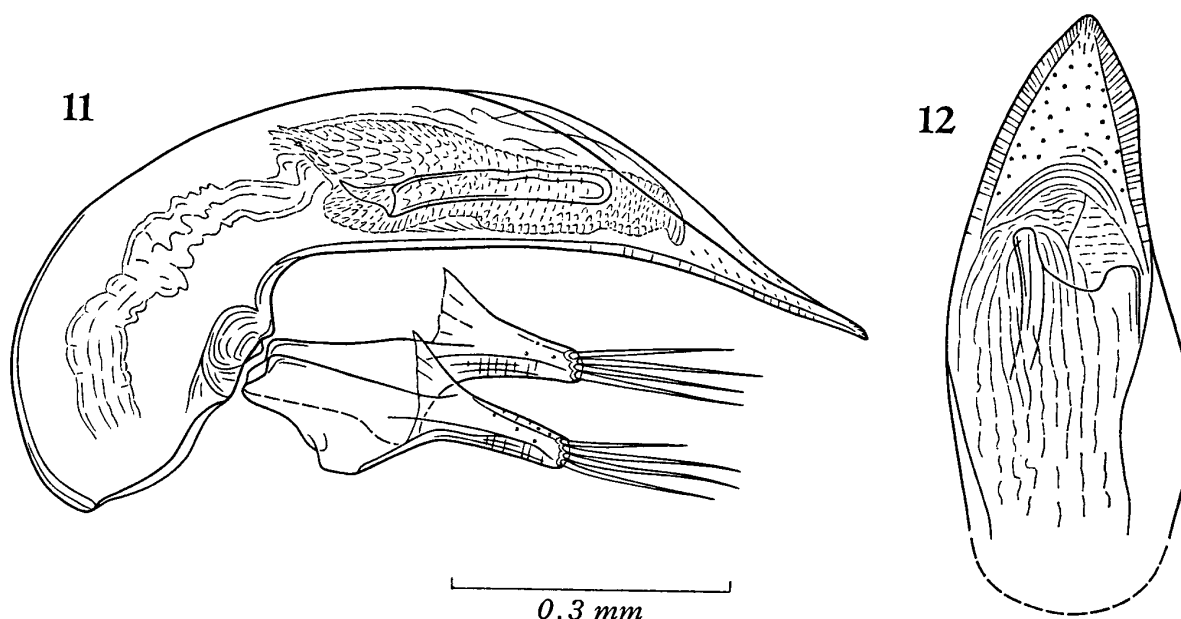
Male genital organ small, though relatively large within the species-group, and rather heavily sclerotized. Aedeagus about one-third as long as elytra, depressed, laterally expanded at middle, and widely membranous on the dorsal surface, with the dorsal margin semicircularly rounded before middle in profile; basal part very large, elongate and moderately curved ventrad, with large basal orifice whose sides are feebly bisinuate; no sagittal aileron; apical part gradually narrowed towards apical lobe, which is unusually long, flattened, and ventro-apically produced; viewed dorsally, apical lobe very broad and asymmetrical in basal half, but isosceles subtriangular in apical half, with blunt tip; viewed laterally, apical lobe narrowly prolonged, very slightly sinuate, and almost pointed at the extremity; ventral margin almost straight at middle in profile. Inner sac wholly scaly, though the scales are only lightly sclerotized even at the proximal part; copulatory piece large, about one-third as long as aedeagus, broad, horizontally spatulate, and nearly parallel-sided, with the apical corners produced into short processes, which are blunt at the tips and of which the right one is longer than the left. Styles small, left style subequal in length to the right and with very short ventral apophysis, each bearing four setae at the apex.

Female unknown.

Type series. Holotype: ♂, paratypes: 2 ♂♂, 10–VIII–1977, Y. SHIBATA leg. All deposited in the collection of the Department of Zoology, National Science Museum (Nat. Hist.), Tokyo.

Type locality. Pi-lu, 2,450 m alt., east of Ta-yu-ling, in Hsin-lin Hsiang of Hualien Hsien, Taiwan.

Notes. This striking new species is widely isolated from the other members of the *multipunctata* group, with possible exception of *E. yushana*, in both external and genitalic features. Its facies resembles those of the members of the *formosana* group, and its male genitalia are unique in the whole genus. The peculiarly shaped copulatory piece — nearly symmetrical, lying horizontally in a ventral position, and bicornuate at the apex — reminds us of those of *Duvalius* species, but the resemblance



Figs. 11–12. Male genitalia of *Epaphiopsis (Formosiellus) divarboris* S. UÉNO, sp. nov., from Pi-lu; left lateral view (11), and apical part of aedeagus, dorso-apical view (12).

is, of course, superficial. I have placed *E. divarboris* in the *multipunctata* group in view of the presence of four or five setiferous dorsal pores on the third elytral stria, but recognition of its own group may become necessary when other species of the same lineage are discovered in the future.

The type specimens of *E. divarboris* were sifted out from dead leaves accumulated at the side of the mountain road leading from Ta-yu-ling to Hua-lien. The collecting site is located on the eastern slope of the Chung-yang Mountain Range, and is about 12.5 km east by north of Mt. Ho-huan Shan, the type locality of *E. kasaharai* and *E. alticola*, and about 22.5 km south by west of Mt. Nan-hu-ta Shan, the type locality of *E. multipunctata*. In a place nearby, there is a famous sacred tree called Shen-mu meaning God's Tree, from which the specific name of the present species is derived.

***Epaphiopsis (Formosiellus) formosana* (JEDLIČKA, 1946)**

(Figs. 13–16)

Tasmanorites formosanus JEDLIČKA, 1946, Descr. Carab. nouv. Asie orient, Praha, p. 2, pl. 2, fig. 12; type locality: Arisan (= A-li Shan Mts.).

Epaphiopsis formosana: UÉNO, 1962, Mem. Coll. Sci. Univ. Kyoto, (B), 29, p. 43. — CASALE & LANEYRIE, 1982, Mém. Biospéol., 9, p. 81.

Length: 3.40–3.95 mm (from apical margin of clypeus to apices of elytra).

Body elongate, somewhat parallel-sided, and well convex on dorsum, with large prothorax and stout appendages. Colour dark reddish brown, shiny, faintly iridescent

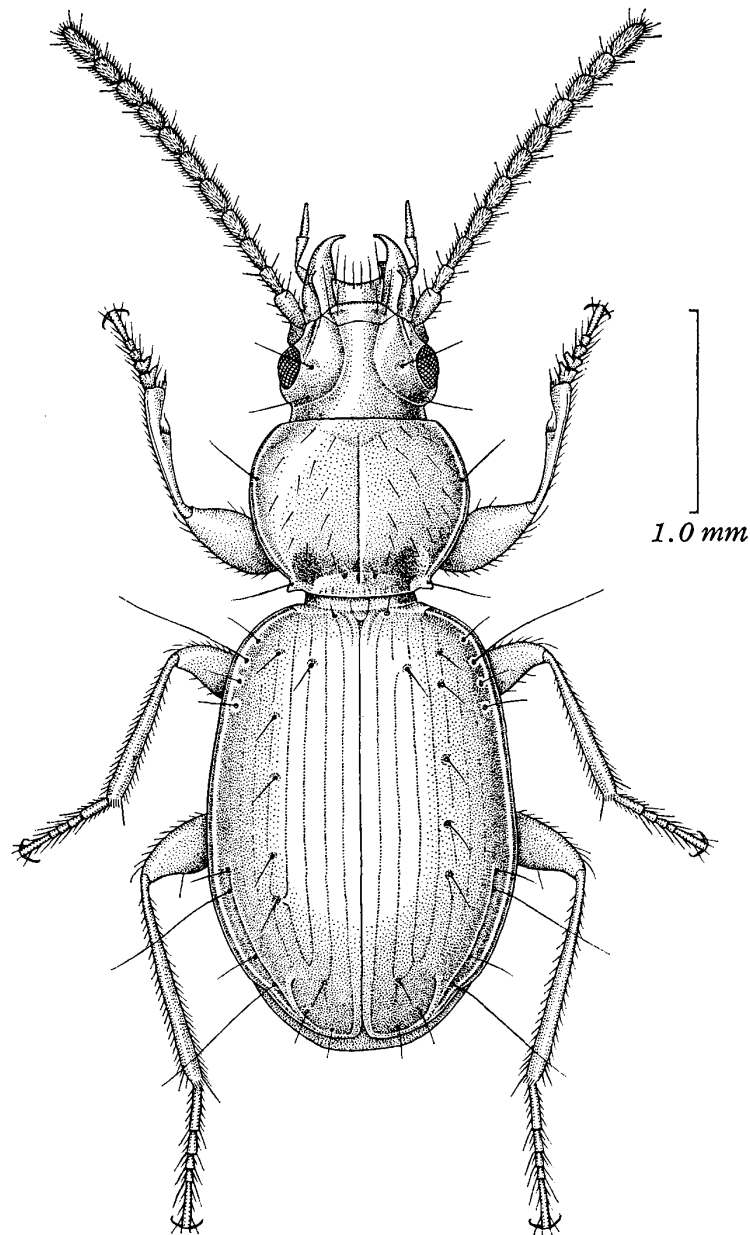


Fig. 13. *Epaphiopsis (Formosiellus) formosana* (JEDLIČKA), ♂, from Chieh-mei Ch'ih on the A-li Shan Mts.

on elytra; palpi pale; apical halves of antennae, ventral surface of hind body, and legs usually somewhat lighter than dorsum.

Head evidently wider than long, depressed above, with deep frontal furrows not angulate at middle; frons and supraorbital areas gently convex; microsculpture sharply impressed, mostly consisting of wide meshes; eyes flat; genae convex, often tumid, three-eighths to a half as long as eyes, and glabrous; labrum shallowly emarginate at

apex; palpi relatively slender, with penultimate segments moderately dilated towards apices; antennae short and stout, reaching basal fifth to fourth (rarely two-sevenths) of elytra, segment 2 only a little shorter than segment 3, which is as long as any of segments 4–7, middle segments subcylindrical, each more than twice as long as wide, segments 8–10 somewhat subovoid, each slightly shorter than middle segments but still more than twice as long as wide, terminal segment slightly longer than scape but about three-fourths as wide as the latter.

Pronotum large and ample, somewhat variable in shape but usually suborbicular, much wider than head, wider than long, usually widest at about three-fifths from base, and equally contracted in front and behind, sometimes (including the holotype) a little more rapidly narrowed in front than behind; PW/HW 1.36–1.50 (M 1.41), PW/PL 1.17–1.34 (M 1.23), PW/PA 1.48–1.62 (M 1.53), PW/PB 1.40–1.61 (M 1.50); surface strongly convex and sparsely pubescent; microsculpture formed by fine transverse lines though partially obliterated; sides moderately reflexed throughout, widely and evenly arcuate from apex to just before base, though the curvature is somewhat variable according to individuals and sometimes (including the holotype) weaker behind middle than before; ante-basal sinuation very brief but deep; apex either straight or slightly arcuate, about as wide as base, PB/PA 0.97–1.10 (M 1.02), with front angles narrowly rounded and not produced; base slightly arcuate at middle and distinctly emarginate on each side close to small hind angle, which is sharply denticulate and postero-laterally produced; median line clearly impressed, more or less widening in basal area and usually reaching or nearly reaching base; apical transverse impression vague, though more or less wrinkled longitudinally and uneven; basal transverse impression deep but uneven, with a longitudinal foveole on each side of median line, and laterally merging into basal foveae, which are fairly large, deep and smooth at the bottom; postangular carinae present though usually obtuse; basal area narrow, uneven, and often longitudinally wrinkled.

Elytra ovate, wider than pronotum, widest at about middle, and more gradually narrowed towards bases than towards apices; EW/PW 1.35–1.48 (M 1.40), EL/EW 1.41–1.51 (M 1.46); surface strongly convex though longitudinally depressed on the disc in basal three-fifths, with the apical declivity relatively gentle; microsculpture mostly obliterated though consisting of fine transverse lines; shoulders distinct, with pre-humeral borders moderately arcuate and perpendicular to the mid-line at the innermost portions; sides moderately reflexed throughout, very feebly arcuate behind shoulders, gently so behind middle, and rather widely and almost conjointly rounded at apices, each with a very slight preapical emargination; striae deeply impressed and distinctly crenulate on the disc, becoming shallower towards the side, but even stria 7 and anterior part of 8 are more or less traceable, 1–5 usually entire, 6–7 usually obsolete in basal area; scutellar striole short but clearly impressed; apical striole short but deep, moderately curved, usually joining or almost joining stria 5 but sometimes directed to stria 7; intervals slightly convex on the disc, apical carina obtuse; setiferous dorsal pores large and more or less foveolate, internal series represented by

a single pore situated at $1/11$ – $1/8$ from base, external series composed of three to six (usually four or five) pores; preapical pore usually situated at the apical anastomosis of striae 2 and 3, and evidently more distant from apex than from suture.

Ventral surface sparsely pubescent except for the lateral parts of respective segments. Legs stout; protibiae almost straight and moderately dilated towards apices; tarsi relatively thick.

Male genital organ small and rather lightly sclerotized. Aedeagus about one-third as long as elytra, feebly arcuate, and widely membranous on the dorsal surface, with the dorsal margin regularly arcuate in profile; basal bulb large, ovoid, almost rectangularly bent ventrad, and devoid of sagittal aileron; basal orifice shallowly emarginate at the sides near its dorsal end; apical part abruptly narrowed from behind apical orifice, especially in lateral view, with short straight apical lobe, whose tip is blunt in lateral view, subtruncate in dorsal view; ventral margin slightly emarginate at middle in profile. Inner sac scaly, especially at the right side, though the scales are hardly sclerotized, with a large adaxial copulatory piece whose proximal part is widely covered at the left side with a round patch of moderately sclerotized, minute teeth; copulatory piece lightly sclerotized and hyaline, elongate, about one-third as long as aedeagus, slightly narrowed towards the apical part, which is ventrally curved and blunt at the tip. Styles short and broad, left style longer than the right and devoid of ventral apophysis, each bearing four (rarely five) stout setae at the apex.

Type depository. Entomologické Oddělení, Národní Muzeum v Praze, Czechoslovakia.

Specimens examined. 1 ♂ (holotype of *Tasmanorites formosanus* JEDLIČKA), Arisan (=A-li Shan Mts.), 2~23-X-1918, J. SONAN & M. YOSHINO leg. (ENMP); 1 ♂, 1 ♀ (both teneral), Wan-sui Shan (2,300 m alt.), 30-VI-1961, S. UÉNO leg. (NSMT); 1 ♂ (teneral), same locality, 4-VII-1961, S. UÉNO leg. (NSMT); 2 ♀♀, same locality, 8-IV-1965, S. UÉNO leg. (NSMT); 1 ♀, same locality, 9-IV-1965, S. UÉNO leg. (NSMT); 1 ♂, 1 ♀ (both teneral), Wan-sui Shan (2,340 m alt.), 3-VII-1961, S. UÉNO leg. (NSMT); 1 ♀, Chieh-mei Ch'ih (2,260 m alt.), 7-VIII-1974, Y. SHIBATA leg. (NSMT); 1 ♂, same locality, 8-VIII-1974, Y. SHIBATA leg. (NSMT); 1 ♀ (teneral), same locality, 5-VIII-1976, Y. SHIBATA leg. (NSMT); 2 ♂♂, 3 ♀♀, same locality, 6-VIII-1979, Y. SHIBATA leg. (NSMT); 1 ♂, same locality, 7-VIII-1979, Y. SHIBATA leg. (NSMT); 1 ♀ (teneral), Ta-t'a Shan (2,340 m alt.), 5-VII-1961, S. UÉNO leg. (NSMT); 1 ♂, Tzu-chung (2,380 m alt.), 25-V-1977, K. TERADA leg. (NSMT).

Localities. Wan-sui Shan, Chieh-mei Ch'ih, Ta-t'a Shan and Tzu-chung, 2,260–2,380 m alt., all on the A-li Shan Mountains in Chia-i Hsien, Taiwan.

Notes. JEDLIČKA's original account of this species is quite perplexing. His description itself is not bad if not sufficient, but the illustration is quite misleading (cf. Fig. 14). The worst of all is the shape of prothorax, which could be regarded as that of a different species. Besides, an extra pore is shown at the terminus of the apical striole of each elytron, which is a product of mere imagination and does not accord with the type specimen. He has overlooked the presence of the discal

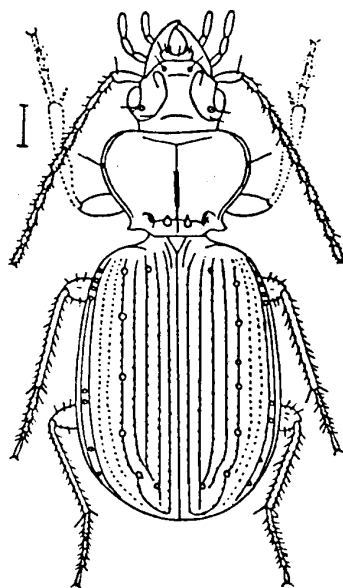


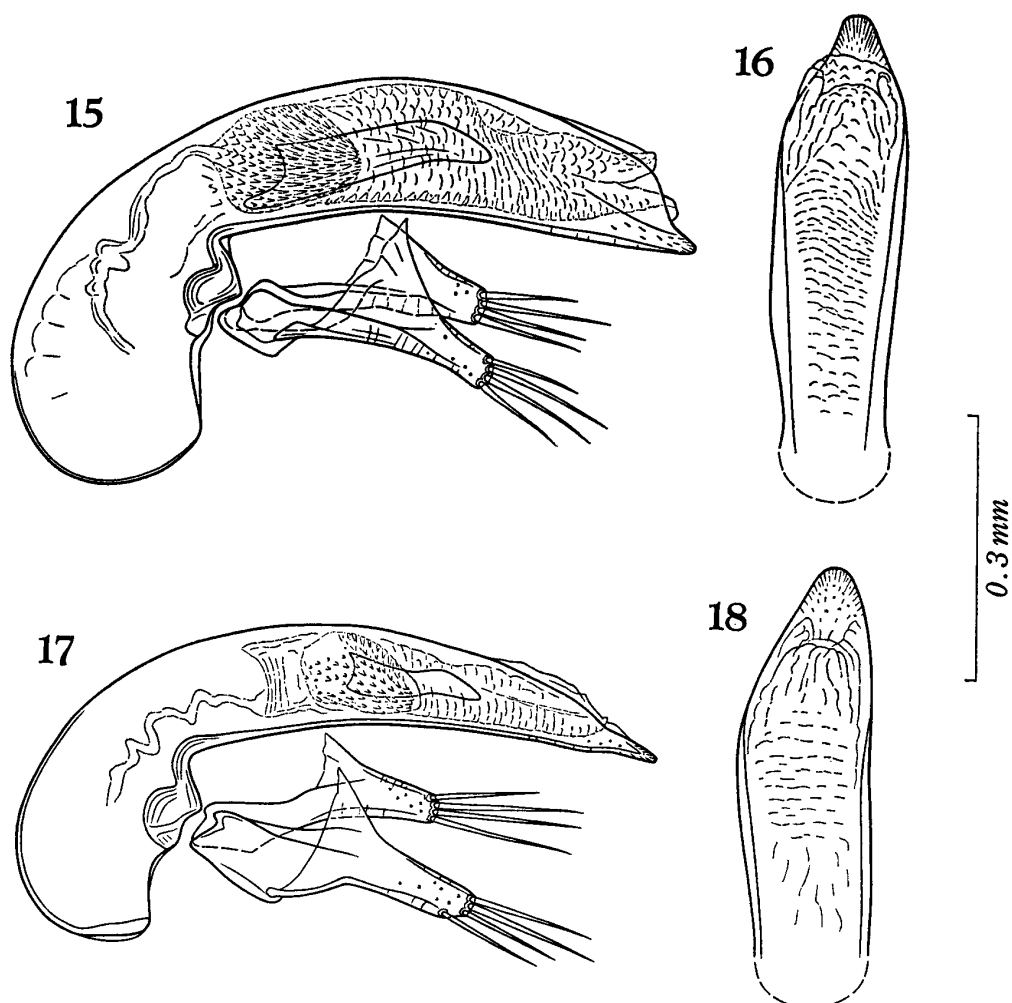
Fig. 14. Original illustration of *Tasmanorites formosanus* JEDLIČKA (after JEDLIČKA, 1946).

pubescence and the postangular pair of marginal setae on pronotum, and seems to have believed that the tibiae and tarsi of the fore legs were lost from the holotype.

In reality, the left fore leg is perfect in the specimen in question, though the tibia and tarsus are lost from the right fore leg; it was formerly gummed under the body, but is now extended and can be examined without detaching the specimen from card. Other than the two labels with collecting data, this type specimen bears a red "TYPUS" label and a pink label inscribed with "*Formosielus formosanus* sp. n." in JEDLIČKA's handwriting. Since this is not the original combination of the trechine's name, I have added to the specimen one more label with the words "Holotype of *Tasmanorites formosanus* JEDLIČKA."

This species seems to be restricted to the A-li Shan Mountains, which lie on the western continuation of the Yü Shan Mountains. Its habitats are usually found under dead leaves or stones lying in humid places in *Abies* or *Cryptomeria* forests. Early in the spring, when high peaks are still snow-clad, this trechine is invariably found under stones embedded in the ground. Immature beetles are seen from the end of June to the beginning of August. These data seem to indicate that hibernation takes place in the adult stage, unlike larval hibernation in the case of *Epaphiopsis* (s. str.).

Epaphiopsis formosana and its direct relatives form a species-group, which is mainly characterized by the presence of only a single setiferous dorsal pore on the 3rd elytral stria. Five species so far recognized are very similar to one another in external features, and can be confidently distinguished only by their male genitalia. However, even their genitalic differentiation is not so pronounced as in the species of the *multipunctata* group, which indicates that their speciation must have taken place much more recently than that of the latter.



Figs. 15–18. Male genitalia of *Epaphiopsis* (*Formosiellus*) spp.; left lateral view (15, 17), and apical part of aedeagus, dorso-apical view (16, 18). — 15–16. *E. (F.) formosana* (JEDLIČKA), holotype, from Arisan (=A-li Shan Mts.). — 17–18. *E. (F.) apiceplana* S. UÉNO, sp. nov., from Mt. Yü Shan.

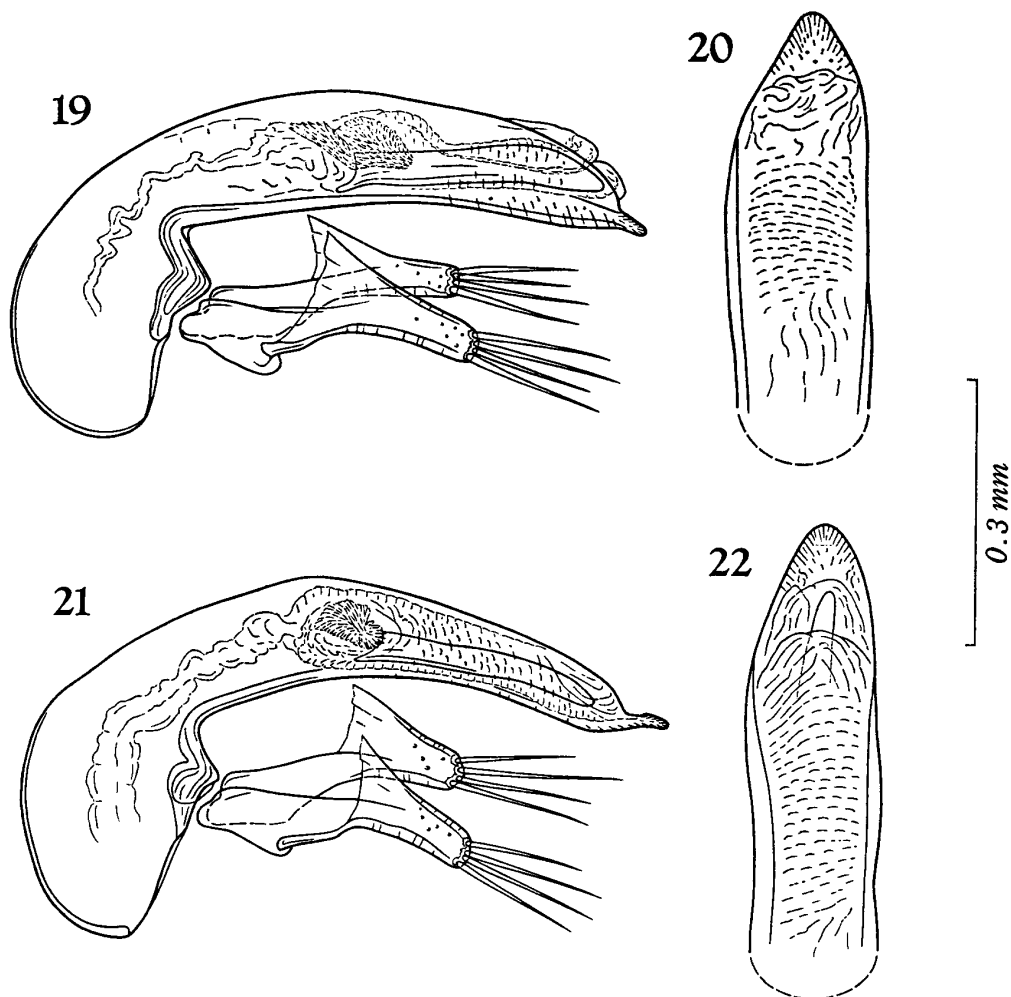
***Epaphiopsis (Formosiellus) apiceplana* S. UÉNO, sp. nov.**

(Figs. 17–18)

Length: 3.60–4.00 mm (from apical margin of clypeus to apices of elytra).

Very closely similar to *E. formosana* and practically indistinguishable from the latter in external morphology, but constantly different in configuration of male genitalia.

Colour usually a little lighter than in *E. formosana*, with reddish brown hind body. Head as in *E. formosana*; eyes rather variable in size though always flat; genae two-sevenths to five-sevenths as long as eyes; antennae somewhat stouter. Pronotum usually with a little more strongly arcuate sides than in *E. formosana*; front angles less



Figs. 19–22. Male genitalia of *Epaphiopsis* (*Formosiellus*) spp.; left lateral view (19, 21), and apical part of aedeagus, dorso-apical view (20, 22). — 19–20. *E. (F.) shibatai* S. UÉNO, sp. nov., from Ts'ui-feng. — 21–22. *E. (F.) alticola* S. UÉNO, sp. nov., from Mt. Ho-huan Shan.

rounded, obtusely angulate. Elytra more shallowly striate, stria 7 and anterior part of stria 8 usually obsolete; internal series of setiferous dorsal pore as in *E. formosana*, external series composed of two to five (usually three or four) pores. Standard ratios of body parts: PW/HW 1.38–1.48 (M 1.42), PW/PL 1.21–1.31 (M 1.25), PW/PA 1.43–1.52 (M 1.48), PW/PB 1.38–1.50 (M 1.44), PB/PA 0.99–1.08 (M 1.03), EW/PW 1.36–1.45 (M 1.39), EL/EW 1.39–1.51 (M 1.46). Legs somewhat shorter than in *E. formosana*.

Male genital organ lightly sclerotized, differing from that of *E. formosana* in the following details: aedeagus about three-tenths as long as elytra, much more flattened, and much more gradually narrowed towards apex in lateral view; basal bulb obviously smaller, with a remnant of sagittal aileron; viewed dorsally, apical lobe broader and

rounded at the tip; viewed laterally, apical lobe narrower and slightly curved ventrad, with the tip almost pointed; copulatory piece much smaller, only one-fifth as long as aedeagus, lying behind the middle, and gently sinuate, with the tip almost pointed.

Type series. Holotype: ♂, allotype: ♀, Yü Shan (3,450 m alt.), 2-VII-1961, S. UÉNO leg. Paratypes: 2 ♂♂, Yü Shan (3,450 m alt.), 20-V-1968, Y. WATANABE leg.; 2 ♀♀, Yü Shan (3,300–3,400 m alt.), 1-VII-1961, S. UÉNO leg.; 1 ♂, Hsi Shan (3,100 m alt.), 1-VII-1961, S. UÉNO leg.; 1 ♂, 1 ♀, Hsi Shan (3,400 m alt.), 2-VII-1961, S. UÉNO leg.; 2 ♀♀, Ch'ien Shan (3,100 m alt.), 1~2-VII-1961, S. UÉNO leg. All deposited in the collection of the Department of Zoology, National Science Museum (Nat. Hist.), Tokyo.

Localities. Mt. Yü Shan (type locality!), Hsi Shan and Ch'ien Shan, 3,100–3,450 m alt., all on the Yü Shan Mountains in Chia-i Hsien, Taiwan.

Notes. This trechine is regarded as an independent species, not as a geographical race of *E. formosana*, because of the constant difference in aedeagal configuration. I have endeavoured to find out intervening populations of *Formosiellus* on the ridge between the A-li Shan and the Yü Shan Mountains, but without success.

Epaphiopsis apiceplana has so far been known only from the western ridge of the Yü Shan Mountains about 3 km in length, on which lie the three peaks, Yü Shan, Hsi Shan and Ch'ien Shan. The westernmost of them, Ch'ien Shan, is about 11.5 km distant to the east-southeast from Wan-sui Shan of the A-li Shan Mountains. The trechine beetle is usually found from under stones lying in humid places near the upper edge of *Abies* forests, but the specimens from the 3,450 m spot on Mt. Yü Shan were taken by sifting dead leaves accumulated at the side of a narrow stream.

***Epaphiopsis (Formosiellus) shibatai* S. UÉNO, sp. nov.**

(Figs. 19–20)

Length: 3.75–4.10 mm (from apical margin of clypeus to apices of elytra).

Very closely similar to *E. formosana* and almost indistinguishable from the latter in external morphology, with the exception of the following points: eyes smaller on an average, genae a half to four-fifths as long as eyes; antennae reaching basal fifth of elytra; setiferous dorsal pores of the external series usually fewer in number, consisting of two to four (usually three) pores. Standard ratios of body parts: PW/HW 1.44–1.51 (M 1.47), PW/PL 1.18–1.27 (M 1.23), PW/PA 1.52–1.62 (M 1.57), PW/PB 1.48–1.55 (M 1.51), PB/PA 1.00–1.09 (M 1.04), EW/PW 1.35–1.42 (M 1.38), EL/EW 1.41–1.51 (M 1.47).

Male genital organ basically similar to that of *E. formosana*, but differing from it in the following details: aedeagus about three-tenths as long as elytra, more flattened, with a little smaller basal bulb; viewed laterally, apical lobe much narrower and parallel-sided, more or less curved ventrad, and blunt at the extremity; ventral margin more deeply emarginate behind middle and always slightly convex just before the base of apical lobe; copulatory piece obviously more elongate and slender, with lanceolate

apical part which is slightly curved ventrad; left proximal teeth-patch smaller and lying dorsally; styles relatively elongate.

Type series. Holotype: ♂, 25–VIII–1974, Y. SHIBATA leg. Allotype: ♀, 26–VII–1974, Y. SHIBATA leg. Paratypes: 6 ♂♂ (incl. 1 teneral), 3 ♀♀, 25–27–VII–1974, Y. SHIBATA leg.; 2 ♂♂, 21–VIII–1976, Y. SHIBATA leg.; 1 ♂, 28–VII–1979, Y. SHIBATA leg. All deposited in the collection of the Department of Zoology, National Science Museum (Nat. Hist.), Tokyo.

Type locality. Ts'ui-feng, 2,200 m alt., on the Ho-huan Shan Mountains in Nan-t'ou Hsien, Taiwan.

Further specimens examined. 1 ♂, 2 ♀♀, Mt. Ho-huan Shan, 3,000–3,100 m alt., Nan-t'ou Hsien, 15–VI–1961, S. UENO leg. (NSMT); 1 ♂, 2 ♀♀, Sung-ch'uan-kang, 2,400 m alt., Jen-ai Hsiang, Nan-t'ou Hsien, 27–III–1987, Y. SHIBATA leg. (NSMT); 1 ♂, Pi-lu Ch'i, 2,300 m alt., Jen-ai Hsiang, Nan-t'ou Hsien, 27–III–1986, Y. SHIBATA leg. (NSMT).

Notes. It is doubtless that the *Formosiellus* occurring on the Ho-huan Shan Mountains is specifically different from *E. formosana* of the A-li Shan Mountains, though it is externally very similar to the latter. As was described above, there is a definite genitalic difference between them, which cannot be regarded as being infraspecific. Besides, these mountain groups are situated on two remote branches of the Chung-yang Mountain Range, and are separated by a distance of more than 80 km beyond a lowland in a NE–SW direction.

Epaphiopsis shibatai seems rather widely distributed on the Ho-huan Shan Mountains. Of the four localities hitherto known, Mt. Ho-huan Shan is, of course, at the centre, while Ts'ui-feng lies on the southwestern ridge about 8.5 km west-southwest of Mt. Ho-huan Shan, and Sung-ch'uan-kang and Pi-lu Ch'i are situated side by side on the northern slope about 7.5 km north-northeast of the main peak.

The Ho-huan Shan specimens (3.70–3.85 mm in the length of body) accord well with the type series, having the following ratios of body parts: PW/HW 1.39–1.47 (M 1.42), PW/PL 1.22–1.27 (M 1.24), PW/PA 1.50–1.57 (M 1.54), PW/PB 1.46–1.49 (M 1.48), PB/PA 1.03–1.06 (M 1.05), EW/PW 1.39–1.43 (M 1.41), EL/EW 1.44–1.48 (M 1.46). In the Sung-ch'uan-kang specimens (3.80–4.00 mm in the length of body), the prothorax is relatively short, setiferous dorsal pores of the external series on the elytra are usually two in number (only one of the three specimens examined bears three dorsal pores on the fifth stria of the right elytron), and the aedeagus is obviously more depressed, with the apical lobe longer and distinctly curved ventrad. The standard ratios of their body parts are: PW/HW 1.42–1.51 (M 1.48), PW/PL 1.27–1.30 (M 1.28), PW/PA 1.54–1.55 (M 1.54), PW/PB 1.48–1.50 (M 1.49), PB/PA 1.03–1.05 (M 1.04), EW/PW 1.36–1.38 (M 1.37), EL/EW 1.42–1.48 (M 1.46). On the other hand, the single specimen (4.05 mm in the length of body) known from the Pi-lu Ch'i, which is very near to Sung-ch'uan-kang, is almost identical with the type series, with the exception of somewhat smaller prothorax and longer apical lobe of aedeagus, which is distinctly curved ventrad as in the Sung-ch'uan-kang male. The external series

consists of three dorsal pores on both the elytra, and the standard ratios of its body parts are as follows: PW/HW 1.43, PW/PL 1.21, PW/PA 1.50, PW/PB 1.44, PB/PA 1.04, EW/PW 1.44, EL/EW 1.46. In short, this species somewhat varies from population to population, but the difference between populations is slight and not decisive.

Like many other species of *Formosiellus*, this trechine is primarily humicolous and is usually taken by sifting dead leaves in subalpine forests. In the alpine zone of Mt. Ho-huan Shan, however, it dwells under stones or rotten logs, as was already noticed in my previous paper (cf. UÉNO, 1987, p. 341).

***Epaphiopsis (Formosiellus) alticola* S. UÉNO, sp. nov.**

(Figs. 21–22)

Length: 3.75–4.05 mm (from apical margin of clypeus to apices of elytra).

Almost identical with *E. shibatai* in external morphology, only differing from the latter in shallower elytral striae and less arcuate apical striole which is almost always directed to stria 7; setiferous dorsal pores of the external series two to three (usually three) in number. Standard ratios of body parts: PW/HW 1.41–1.50 (M 1.46), PW/PL 1.16–1.29 (M 1.23), PW/PA 1.50–1.63 (M 1.57), PW/PB 1.41–1.56 (M 1.51), PB/PA 0.96–1.08 (M 1.04), EW/PW 1.37–1.40 (M 1.39), EL/EW 1.45–1.52 (M 1.48).

Male genital organ identical in basic structure to that of *E. shibatai*, but evidently differing from it in the following points: aedeagus much more strongly arcuate, with narrower apical part and larger basal bulb; viewed laterally, apical lobe distinctly curved dorsad and slightly sinuate, with dorsally thickened terminal portion and blunt extremity; viewed dorsally, apical lobe narrower at base and more gradually narrowed towards narrowly rounded extremity; in lateral view, ventral margin widely and deeply emarginate at middle and strongly convex before the base of apical lobe; copulatory piece narrower; left proximal teeth-patch smaller; styles shorter and broader.

Type series. Holotype: ♂, allotype: ♀, 30–VII–1983, Y. SHIBATA leg. Paratypes: 1 ♂, 1 ♀, 30–VII–1983, Y. SHIBATA leg.; 3 ♂♂ (all teneral), 1 ♀, 31–VII–1983, Y. SHIBATA leg.; 1 ♀ (teneral), 1–VIII–1983, Y. SHIBATA leg. All deposited in the collection of the Department of Zoology, National Science Museum (Nat. Hist.), Tokyo.

Type locality. Mt. Ho-huan Shan, 3,100 m alt., in Nan-t'ou Hsien, Taiwan.

Notes. This trechine was first considered to be an alpine form of *E. shibatai*, but is now regarded as a full species, since its aedeagus shows a definitely different configuration, and since it is sympatric with the latter. It is true that the two species have not been found in the same micro-habitat, but their ranges are apparently overlapping.

All the known specimens of *E. alticola* were found in a small marshy area on the eastern slope of Mt. Ho-huan Shan, usually from under stones. This micro-habitat seems subtly different from those of *E. kasaharai* and *E. shibatai*, both of which occur in nearby places on the same slope of the mountain.

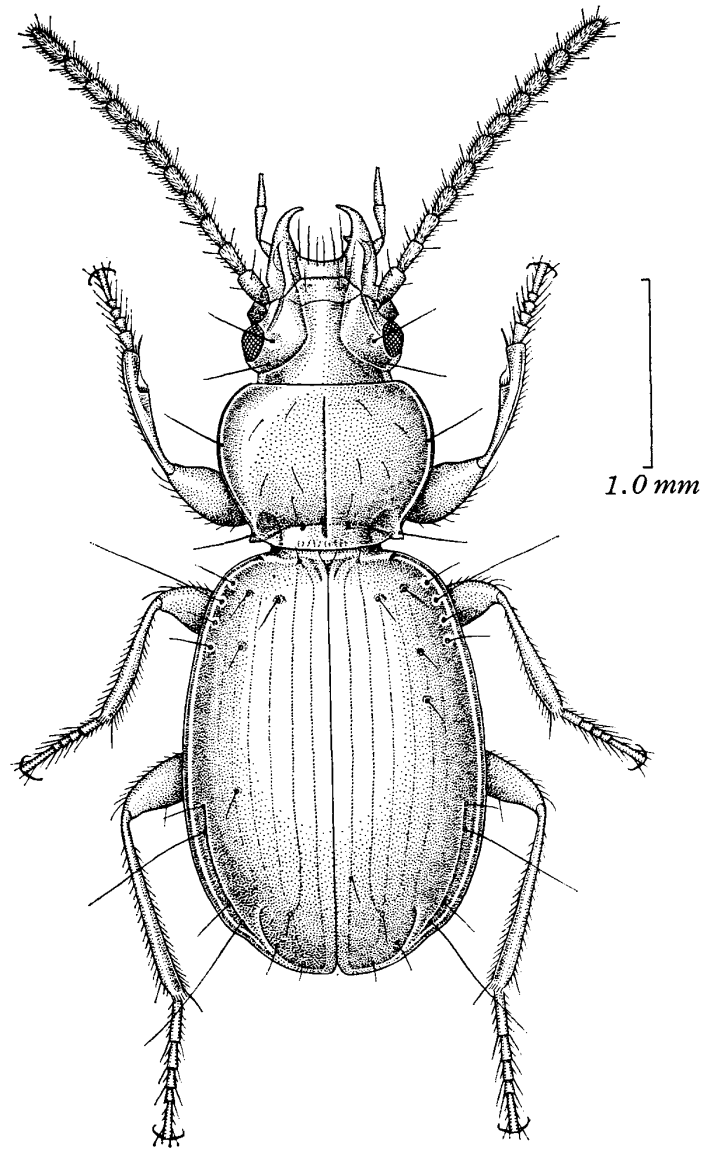


Fig. 23. *Epaphiopsis (Formosiellus) hsuehshana* S. UÉNO, sp. nov., ♀, from Mt. Hsüeh Shan.

***Epaphiopsis (Formosiellus) hsuehshana* S. UÉNO, sp. nov.**

(Fig. 23)

Length: 3.80 mm (from apical margin of clypeus to apices of elytra).

Closely allied to *E. shibatai*, but differing from it in lighter coloration, larger head, sparser pubescence on pronotal disc, shallower elytral striae, and so on.

Concolorously light reddish brown, shiny, slightly iridescent on elytra; palpi and tarsi somewhat paler. Head larger than in *E. shibatai* though structurally similar to the latter; genae convex, about five-ninths as long as eyes; antennae reaching basal fifth of elytra. Pronotum similar in configuration to that of *E. shibatai*, but obviously

wider at apex, with the sides less strongly arcuate in front; surface much more sparsely pubescent, bearing only five hairs on each side of median line; PW/HW 1.39, PW/PL 1.26, PW/PA 1.49, PW/PB 1.44, PB/PA 1.03.

Elytra suboval and convex, with the apical declivity relatively gentle, widest at about middle; EW/PW 1.39, EL/EW 1.45; apical parts ample, with apices widely rounded though forming a small re-entrant angle at suture; shoulders widely rounded, with prehumeral borders feebly arcuate and evidently oblique at the innermost portions; sides feebly arcuate before middle but moderately rounded in apical halves, each with a very slight preapical emargination; striae superficial, lightly impressed and crenulate on the disc, but obsolete at the side, stria 6 barely visible as fragments, 7 and anterior part of 8 vanished; scutellar striole short but distinct; apical striole also short but deep, moderately curved, and directed to stria 5; setiferous dorsal pores of the external series three in number, though irregularly spaced in the holotype (cf. Fig. 23); an extra dorsal pore present at apical fifth of stria 1 on the right elytron in the holotype; preapical pore situated at the apical anastomosis of striae 2 and 3, and more distant from apex than from suture. Legs short and stout; protibiae slightly arcuate in apical parts.

Male unknown.

Type specimen. Holotype: ♀, 22-VI-1961, S. UÉNO leg. Deposited in the collection of the Department of Zoology, National Science Museum (Nat. Hist.), Tokyo.

Type locality. Mt. Hsüeh Shan, 3,300–3,500 m alt., in T'ai-chung Hsien, Taiwan.

Notes. Though unfortunately a female, the specimen recorded above from Mt. Hsüeh Shan no doubt belongs to a new species, as it is considerably different in external features from the other known members of the *formosana* group, all of which are very similar in facies to one another. Genitalic peculiarities of the new species will certainly be found in the future when males are known.

The single known specimen of *E. hsuehshana* was found mingled with *E. elegans* in a sample of humicolous animals taken by sifting thick moss-mats in an *Abies* forest.

References

- CASALE, A., & R. LANEYRIE, 1982. Trechodinae et Trechinae du monde. Tableau des sous-familles, tribus, séries phylétiques, genres, et catalogue général des espèces. *Mém. Biospéol.*, **9**: i+1–226.
- DEUVE, T., 1988. Nouveaux Carabidae et Trechidae de Chine [Coleoptera]. *Rev. fr. Ent.*, (n. s.), **10**: 249–259.
- JEANNEL, R., 1962. Les Trechini de l'Extrême-Orient. *Rev. fr. Ent.*, **29**: 171–207.
- JEDLIČKA, A., 1932. Neue Carabiden aus Ost-Asien. Formosa (H. SAUTER's Formosa Ausbeute), Corea, China. *Čas. Čs. Spol. ent.*, **29**: 79–86.
- 1946. Description des Carabides nouveaux des l'Asie orient. 16 pp., 2 pls. Private publication, Praha.
- SHILENKOV, V. G., & I. M. SOKOLOV, 1987. Two new species of Trechini (Coleoptera, Carabidae) from SW Altai. *Annls. ent. fenn.*, **53**: 102–104.
- STOROZHENKO, S. Yu., & A. I. OLIGER, 1984. A new species of Grylloblattida from north-eastern Altai. *Ent. Obozr.*, **63**: 729–732. (In Russian, with English summary.)

- SUENSON, E., 1957. Trechinae from the Far East with description of new species collected by E. SUENSON. *Ent. Medd.*, **28**: 84–96, pls. 1–2.
- UÉNO, S.-I., 1953. Studies on the Japanese Trechinae (I) (Coleoptera, Harpalidae). *Ent. Rev. Japan, Osaka*, **6**: 30–34, pl. 7.
- 1962. Primitive trechids of the subgenus *Epaphiopsis*. *Mem. Coll. Sci. Univ. Kyoto*, (B), **29**: 41–74.
- 1971. The trechine beetles of the Hidaka and the Yûbari Mountain Ranges in Hokkaido, northern Japan. *Mem. natn. Sci. Mus., Tokyo*, (4): 5–28.
- 1976. *Tienmutrechus dispersipunctis*, an extraordinary trechine beetle from eastern China. *Bull. natn. Sci. Mus., Tokyo*, (A), **2**: 123–128.
- 1978. The cryptozoic trechines of the subgenus *Epaphiama* (Coleoptera, Trechinae). *Ibid.*, (A), **4**: 123–146.
- 1979. Occurrence of a new alate species of *Trechiana* (Coleoptera, Trechinae) in Taiwan. *Ibid.*, (A), **5**: 201–206.
- 1980. *Agonotrechus horni* (Coleoptera, Trechinae), a Taiwanese species showing an altitudinal wing dimorphism. *Ibid.*, (A), **6**: 107–114.
- 1982. Origin and dispersal of the Trechina in East Asia (Coleoptera: Carabidae). *Ent. gen., Stuttgart*, **8**: 71–77.
- 1987. A new saproxylophilous trechine beetle from central Taiwan. *Kontyû, Tokyo*, **55**: 333–341.
- 1988. The distribution and differentiation of trechine beetles in Japan. In SATÔ, M. (ed.), *The Beetles of Japan, with Special Reference to their Origin and Differentiation*, pp. 33–51 + 3–5. Tokai University Press, Tokyo. (In Japanese.)
- & J. PAWŁOWSKI, 1983. Occurrence of *Epaphiopsis* (Coleoptera, Trechinae) in the eastern Himalayas. *Annot. zool. japon.*, **56**: 141–148.